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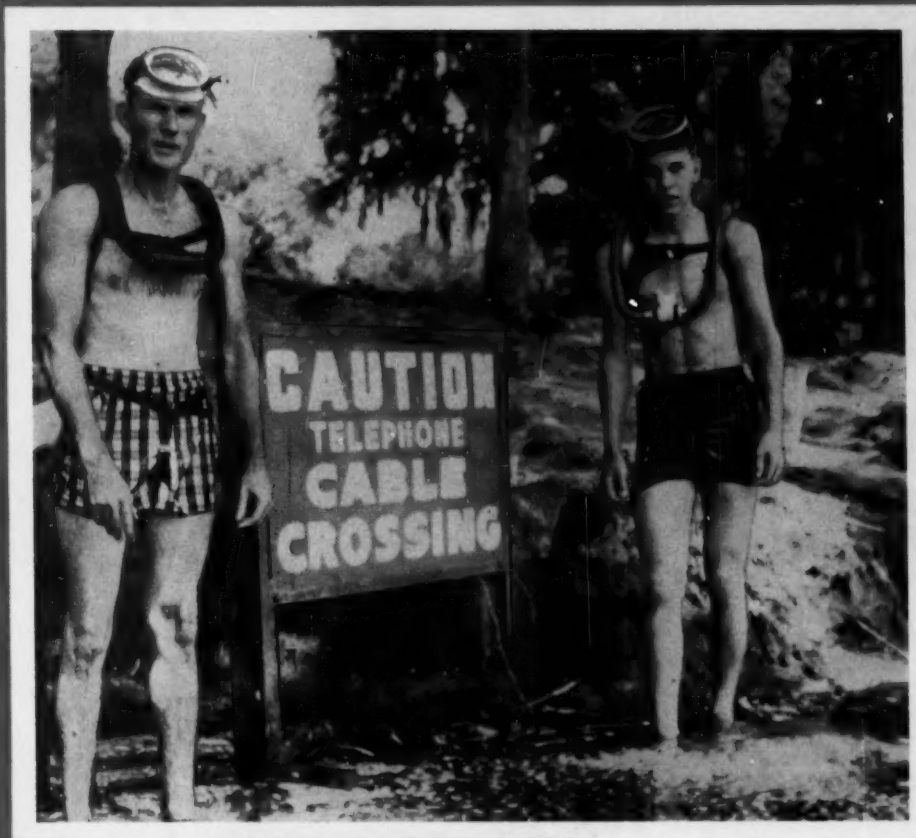
Telephony

THE JOURNAL OF THE
TELEPHONE INDUSTRY
SINCE 1901



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Guaranteed Circulation This Issue
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UNDERWATER CABLE

J. W. Huggins (left) and Jim Hulbert, Winter Park (Fla.) Telephone Co., wear aqua lung equipment to search for cable on bottom of lake. After locating cable it was staked out 40 ft. to protect it during erection of a retaining wall.

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FLASHES AND PLUGS

WHAT PRICE FUN? "Tired and hungry"—and frustrated—describes the German salesman traveling from city to city in his country and staying at a different hotel each night.

The frustration gradually built up over a long period because each night when he registered at the hotel, there would be the same official form, sometimes, yellow, sometimes pink or white, but always with the same questions, to be filled out by the traveler.

Questions such as—What's your name, where do you live, date and place of birth, what's your occupation, your passport number, where issued, when issued, who issued it, name of your wife, her maiden name, number of children with you (if any)?

Eleven years ago when salesman Hans Jochem Kehrl first began filling out this form, he complained it was "Useless, bureaucratic nonsense." Then and there, he began his campaign to see if it made any difference what he wrote on the form.

Since then, he has resignedly filled out the form, but had a little fun along with doing the time-consuming report. As to "occupation," he listed himself variously as "rat catcher," or "bear trainer" or whatever popped into his head. His many birth dates, he admitted, never appeared on any calendar.

"I was born," he said, "mostly in the Himalayas or in Sodom or in Gomorrah."

His identification number was the series of digits 1, 2, 3, 4, 5, 6, 7 or his auto license.

Occasionally, he tried putting down the correct information, and also writing "an idiotic procedure," and if he had a qualm of conscience, he scribbled on the margin of the ever-present form —"sorry."

No one ever noticed. Except a few porters who laughed about it. And he did it for 11 years. By this time, Kehrl's patience was shredded thin, so he consulted the criminal code and began to put himself down as a "burglar," "forger," "embezzler," and finally, a "swindler." To the last occupation, he penned his correct name and address.

That did it. In Frankfort, in August, 1959, an excited hotel porter telephoned the police, who telephoned the salesman's home town of Kassel. Kehrl was promptly identified as "a highly respectable publishing house salesman."

The police ran Kehrl in, nevertheless. The charge: "Violation of article 25, paragraph 2 of the ordinance concerning registration. He listed himself as a 'swindler,' although he did not carry on this trade." Furthermore, he was told that he must expect to have to pay a fine.

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Telephony

THE JOURNAL OF THE TELEPHONE INDUSTRY
Since 1901

September 12, 1959

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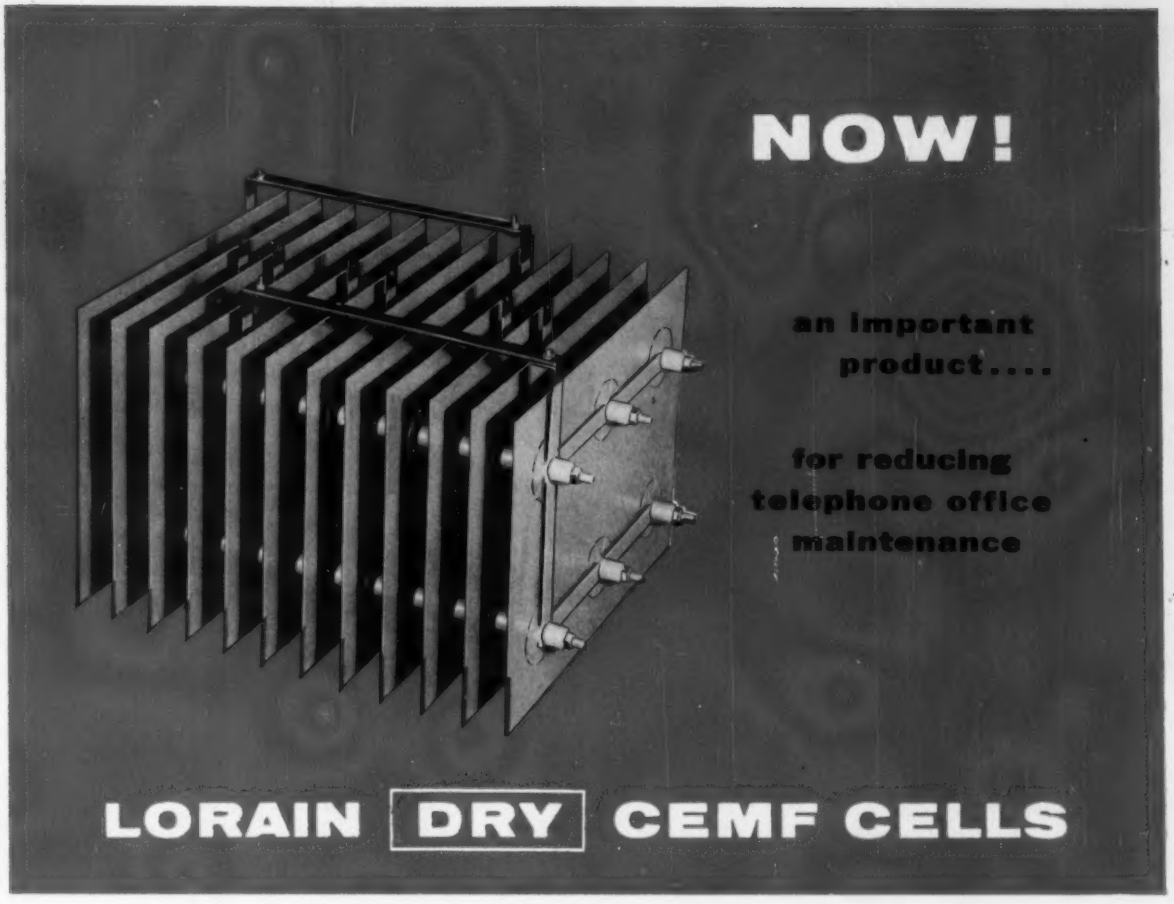

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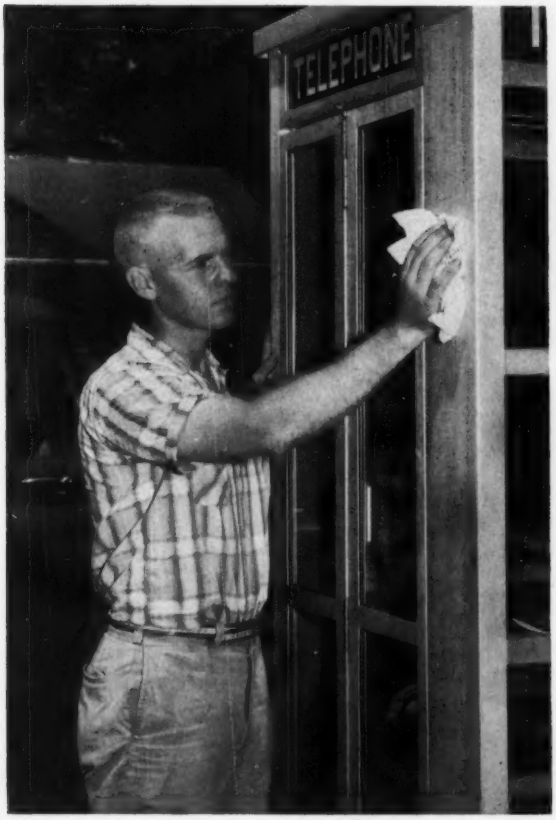

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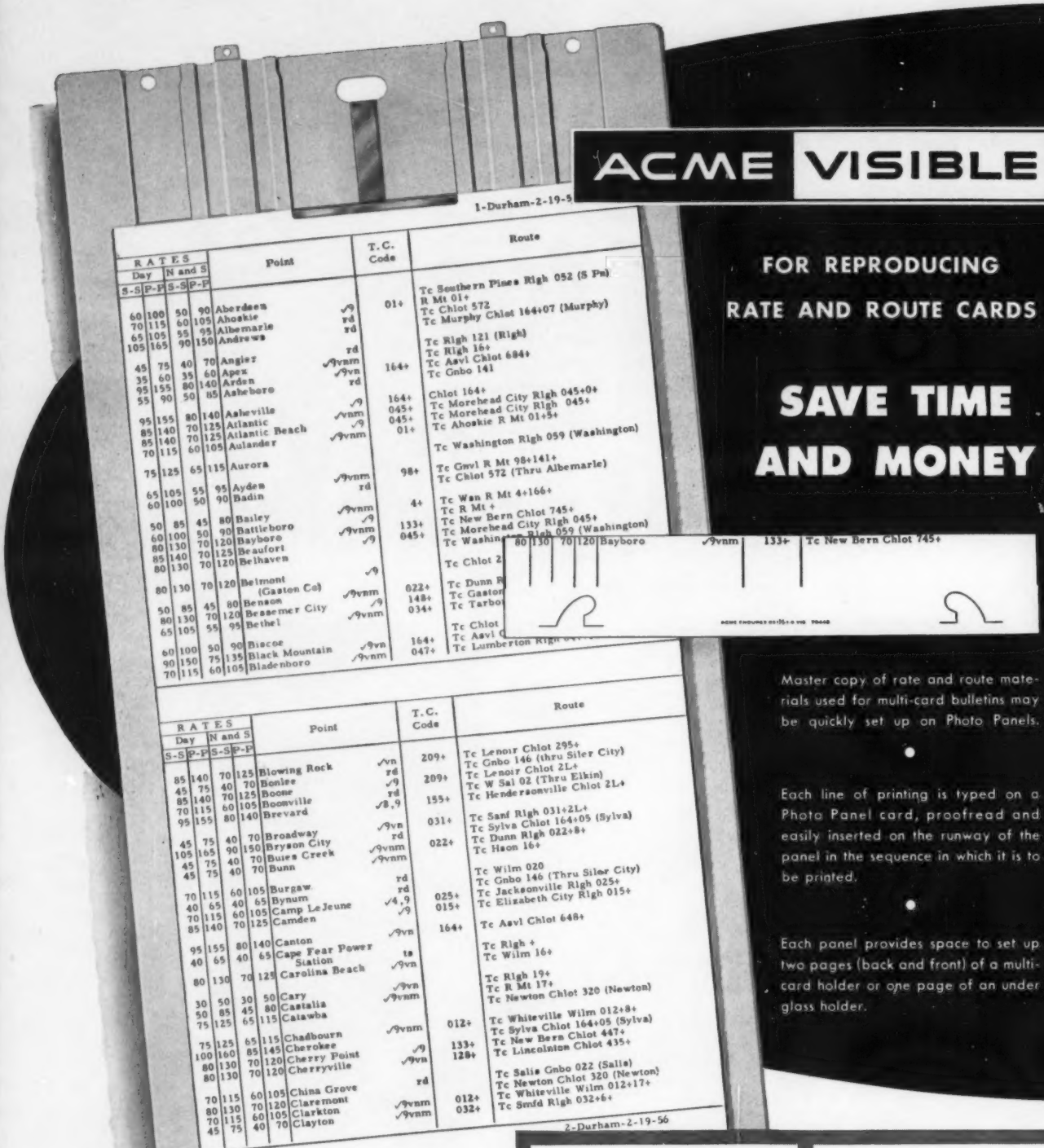

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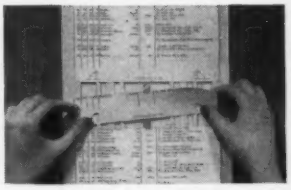

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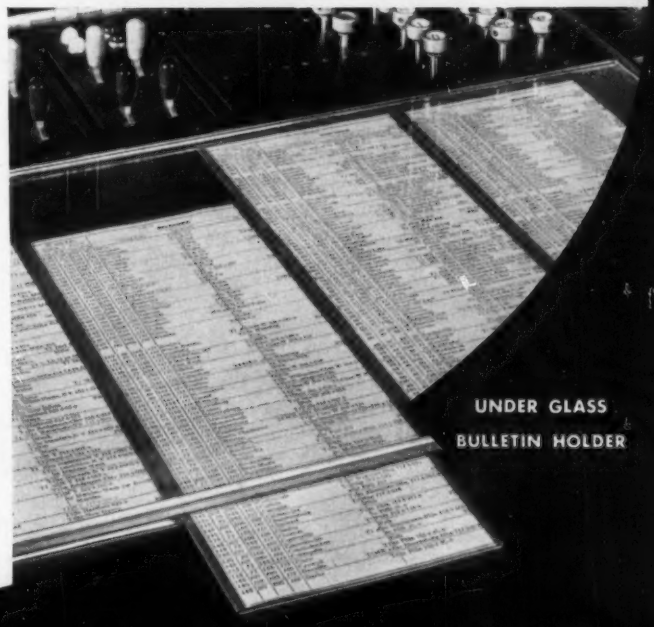

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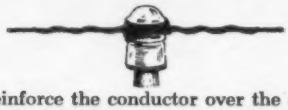

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IN THE NATION'S CAPITAL

BY FRANCIS X. WELCH, WASHINGTON EDITOR
AND EDITOR, PUBLIC UTILITIES FORTNIGHTLY

86th Congress accomplished much more than most Washington observers expected. . . . Reviews actions of particular interest to telephone industry.

AS THESE lines were written the first session of the 86th Congress had but a few hours before passing into history. In many ways it was a most remarkable session. It accomplished much more than generally expected by most observers—and that includes this observer.

The reference here to accomplishment is in the broadest sense of the word—meaning the achievement of desirable results in both positive and negative ways. To put it another way, the 86th Congress did a number of things which should have been done. And it failed to do a number of things which might better be left undone—for the present at least. And if that sounds a little like this writer is assuming too much authority for passing judgment on what is desirable, he hastens to add that the judgment passed is simply within a well-known framework of what is regarded as desirable from the standpoint of the telephone business in particular, for other regulated industries, and the business community in general. After all, their interests are all pretty much on record, as to what they want and don't want. It is not necessary for your correspondent to classify on his own.

But to get back to the 86th Congress, it must be admitted that the early outlook was a gloomy one. The Congress assembled last January with top-heavy Democratic majorities in both chambers. Most of the majority freshmen had achieved their victory at the polls last November from northern and western districts under so-called liberal auspices, and heavily indebted in many instances to labor union sponsorship.

Under the circumstances, such a Congress confronted with the problem of working out legislation with a middle-of-the-road Republican President looked like a sure bet to end up with a record of stalemate and frustration. Certainly, it was reasonable to suppose any bill for the correction of labor union abuses, with real teeth in it, would stand little chance. On the contrary, it was to be expected that legislation sought by the labor groups as well as by other liberal elements and free spenders, such as public ownership people, would have things pretty much their own way in Congress. And that, in turn, would mean a dreary succession of presidential vetoes with a good chance for overriding the same in some instances.

But such generalizations failed (as it turned out) to give proper weight to the re-establishment of the old coalition between some senior southern Democrats and the minority Republican leadership. As to the latter, the emergence of the House minority leader, Rep. Charles A. Halleck of Indiana, has been perhaps the outstanding feature of the session from the standpoint of individual performance.

Charlie Halleck's Congress?

Halleck took over the reins of minority leadership from the aged hands of former Speaker Joe Martin of Massachusetts, in what was dubbed as the "young Turk's rebellion." This development in itself had been expected to divide further the shrunken Republican minority. Instead, Halleck has come back to rally the Republicans in the House to sensational feats of party discipline and loyalty to the President. Through several hair-line votes upholding the President's veto of legislation which he deemed undesirable, Halleck managed to out-maneuver even the old veteran speaker of the House, Sam Rayburn. As *Newsweek* recently commented: "To some congressmen, it seemed last week that the 86th Congress might go down in history not as a Democratic Congress, but as Charlie Halleck's."

The most exciting photo finish of all was the House's vote (Sept. 2) on the public works bill by which the President's veto was sustained by the margin of a single vote (274 to 138). This bill had been vetoed by the President as containing too much pork and upsetting his earlier budget estimates by too great a margin. It was a spenders' bill, of course. There was a piece of pork in it for nearly every congressional district in the country, Republican and Democratic alike. That made it awfully hard to beat.

It breezed through the Senate, which is considerably to the left of the House, ideologically speaking, with hardly a murmur. The Republicans in the House showed, in a few early test votes, that they might have a bare chance to sustain a veto, but it was a long shot at best. What the President objected to was the inclusion of 67 unbudgeted projects which he estimated would, in the long run, cost nearly 800 million dollars. He did not say that they were undesirable. On the contrary, he said that eventually the nation might well be able to afford them, but not now.

When the final vote was counted, it was pretty much of a partisan division. Only 11 Republicans (three of those

from the East) jumped the party line to vote against the veto, while only six Democrats (three from Virginia) joined the minority to sustain the President.

But it was the floor strategy that won the respect of all the "pros" on both sides of the aisle for Halleck's leadership. When the vote was first announced, it was indicated that the President's veto had been sustained by a single vote. After Speaker Rayburn checked the tally, Rep. Clarence Cannon (D., Mo.) solemnly announced that he had been "confused" in voting the wrong way. This is an old dodge and only provokes smiles because Cannon, as chairman of the House Appropriations Committee, looked about as confused as a fox in a chicken coop. But that is the usual gambit for getting a recount on a close vote.

Halleck had anticipated the move and gave a signal for one of his reserved Republican members to jump the other way. That put the score back at one-vote margin for the President's veto. Again, Speaker Rayburn recognized a Democratic member for purposes of changing his vote, and again Halleck matched it from a little supply of "spares" which he had been holding in reserve for just such an emergency. On the third go-around, Rayburn now knew that the jig was up, or maybe he had run out of "spares" himself. Anyhow, when the vote was finally announced the result was one up for the President's veto and the little Republican minority had carried the day. Despite angry denunciations and recriminations the Democrats finally had to knuckle down and pass a modified spending bill. They were still arguing about it at this writing.

Not all of the decisive votes in the congressional session were quite so dramatic, but some of them were pretty close. Readers may recall the effort to take the fiscal control over the Rural Electrification Administration's loan program away from the Secretary of Agriculture. It missed in the House by a mere four votes.

On the positive side, there was the surprising victory in the House for the Landrum-Griffin Bill to regulate labor union management. But Halleck can hardlly take a bow on that one. The person chiefly responsible for passing a strong labor bill was none other than Jimmy Hoffa, the boss of the Teamsters Union. He got a very good assist from Jim Carey of the International Electrical Workers Union. Both of these labor leaders without realizing it made votes for the legislation simply by popping off at the wrong time.

REA Approves Loans to Three

The Rural Electrification Administration approved loans, totaling $8,252,000, as follows during the week of Aug. 24:

North-West Telephone Co., Tomah, Wis.; $7,500,000; Aug. 25.

This loan will enable the new borrower to improve service for 15,315 existing subscribers and to furnish initial service to 5,523 subscribers.

The company now furnishes dial service through three of its 19 exchanges, common battery and magneto service through the remaining 16. Main headquarters of the company are at Tomah. Seven other regions are served by branch offices at Cadott, Chetek, DeForest, Delafield, East Troy, Ripon and Spooner.

Fifteen new automatic central offices will be constructed, some of which will house garage and workshop space. Included is a combined automatic office and main headquarters building in Tomah.

New automatic facilities will be installed in 17 of the exchanges. Present dial equipment in the East Troy and North Prairie exchanges will be retained and enlarged. The LaGrange exchange will be eliminated and that community served from the Palmyra exchange. The borrower also plans to divide the Tomah exchange, the larger portion of which will be known as Tomah, and the remainder as the Warrens exchange.

When the planned rehabilitation and expansion of this system is complete, it will be furnishing new and improved service to 20,838 subscribers through 19 exchanges.

Harris G. Allen is president and August Steinhart is manager of the North-West company.

•

Rockwell (Ia.) Cooperative Telephone Association; $96,000; Aug. 27.

These funds will be used to improve and expand the facilities of the Aredale Cooperative Telephone Association which the borrower has recently acquired. Provision is made in the loan to reimburse the borrower for this acquisition. At present, 150 subscribers are receiving magneto service from the Aredale system.

The borrower plans to construct a new automatic central office at Aredale and to provide improved service for the existing subscribers, and initial service to 17 subscribers.

REA loans to this borrower, which now total $467,000, will enable it to furnish new and improved service to 958 subscribers. The system, when complete, will consist of exchanges at Aredale, Dougherty, and Rockwell. The latter two are now furnishing dial service to approximately 730 subscribers.

Orrin Schreckengost is president and Emmett Wiley is manager of the Rockwell cooperative.

•

Four States Telephone Co., Brownwood, Texas; $656,000; Aug. 27.

These funds will enable the borrower to furnish initial service for 986 subscribers in Arkansas. There are no telephone facilities in the new areas to be served by the borrower.

The borrower's plans include new automatic central offices at Jesup, Delaplaine and Hickory Plains, all in Arkansas.

REA loans to the Four States company now total 1.6 million dollars. They will benefit 2,670 subscribers.

Chester H. Loveland is president and D. T. Strickland is manager of the Four States company.

The net result, however, is a new law which will not hurt any honest labor union, but will make union leaders responsible to their membership for the conduct of union affairs. The new law also contains some long-needed restrictions on picketing abuses. Incidentally, in the give and take between House and Senate conferees, there was eliminated a provision which would have frozen telephone supervisors with respect to labor union organization. This provision was contained in the much milder Kennedy-Ervin Bill, passed by the Senate. Without going into details, this important bill, which covers telephone as well as other utilities, makes a real attempt to give back to union members the right to run them in a democratic manner: Secret ballots, regular elections, full financial reports, liberty of speech, etc.

There are penalties for union bosses who try to get around these requirements. There are also stiff penalties

(Please turn to page 49)

Transmission Aspects of the

NATIONWIDE SWITCHING PLAN

By STANLEY L. WILSON*

THE NATIONWIDE switching plan that has been set up represents a traffic routing concept radically different from the past philosophy of a maximum of direct routes with a minimum of switching. This new scheme results in most over-all connections being composed of several links, depending on the route chosen by the switching system at the moment a particular call is placed. As many as seven intertoll trunks in addition to two terminating links and both subscriber's loops may be used in tandem. It thus becomes imperative for all possible connections to result in a completed circuit of very low loss. This grade of transmission will avoid undue contrast between various routes chosen by the switching network at various times and will satisfy today's critical telephone subscribers.

Let us examine separately each component of an over-all completed connection and see what we must do to furnish optimum transmission:

(1) *Inter-toll Facilities.* Every intertoll circuit between Class 4 and higher grade offices must be operated at the lowest possible loss with special considerations given to factors such as singing, echo, noise and crosstalk, hence, the term "via net loss operation." Via net loss operation is readily possible on carrier facilities when proper repeat coil hybrid terminations are used. Since most inter-toll facilities are already on carrier this does not present a formidable problem.

(2) *Central Office Equipment.* A high degree of impedance matching (15 decibels average echo return loss at Class 4 offices) is needed to stabilize low-loss circuits from an echo and singing viewpoint. This is readily accomplished with the precision networks used at four-wire switching points. However, in the less costly two-wire switching systems (crossbar tandem and step-by-step systems) compromise networks are used which must be made to match all possible connections through the office.

The compromise network has a fixed resistance which retains the same magnitude at all frequencies, while loaded outside facilities terminated in a half section experience an increase of the resistance component with frequency, resulting in a rapidly deteriorating return loss against the compromise network as the cut-off frequency is approached. Since the return loss of these end-links must be high through the frequency range involved in the usual connecting carrier circuits, any loaded facilities with a cut-off frequency below approximately 3,500 cycles must have an associated impedance compensator located at the toll office end.

This impedance compensator causes the sending-end impedance of a loaded cable pair to remain predominantly resistive and relatively uniform in magnitude in the frequency range from 1,000 cycles to a point at approximately 85 per cent of the cut-off frequency.

A diagram of the impedance compensator is shown in *Fig. 1*. It is evident that any incorrect or missing impedance matching coils will upset this whole improvement program, so that a thorough check of all coils and circuits is in order at both ends of the circuit. We cannot sufficiently stress the importance of use of the correct repeat coil and condenser in the trunk circuits. Older types of repeat coils, although of correct matching ability, may not

*Mr. Wilson is Manager of Equipment Sales of Hallamore Electronics Co. of Anaheim, Cal.

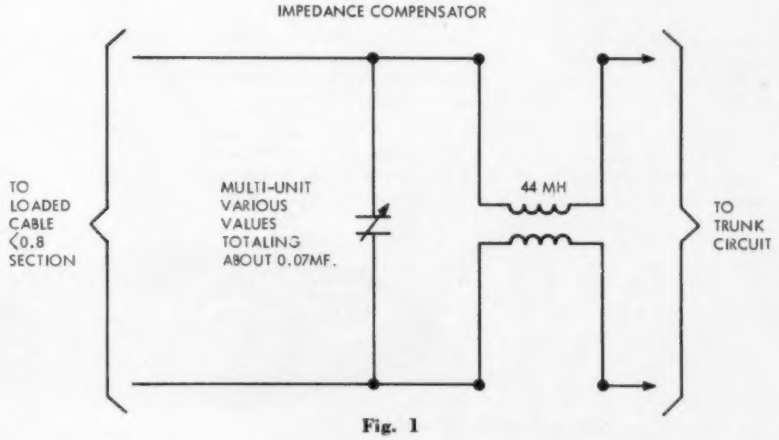

Fig. 1

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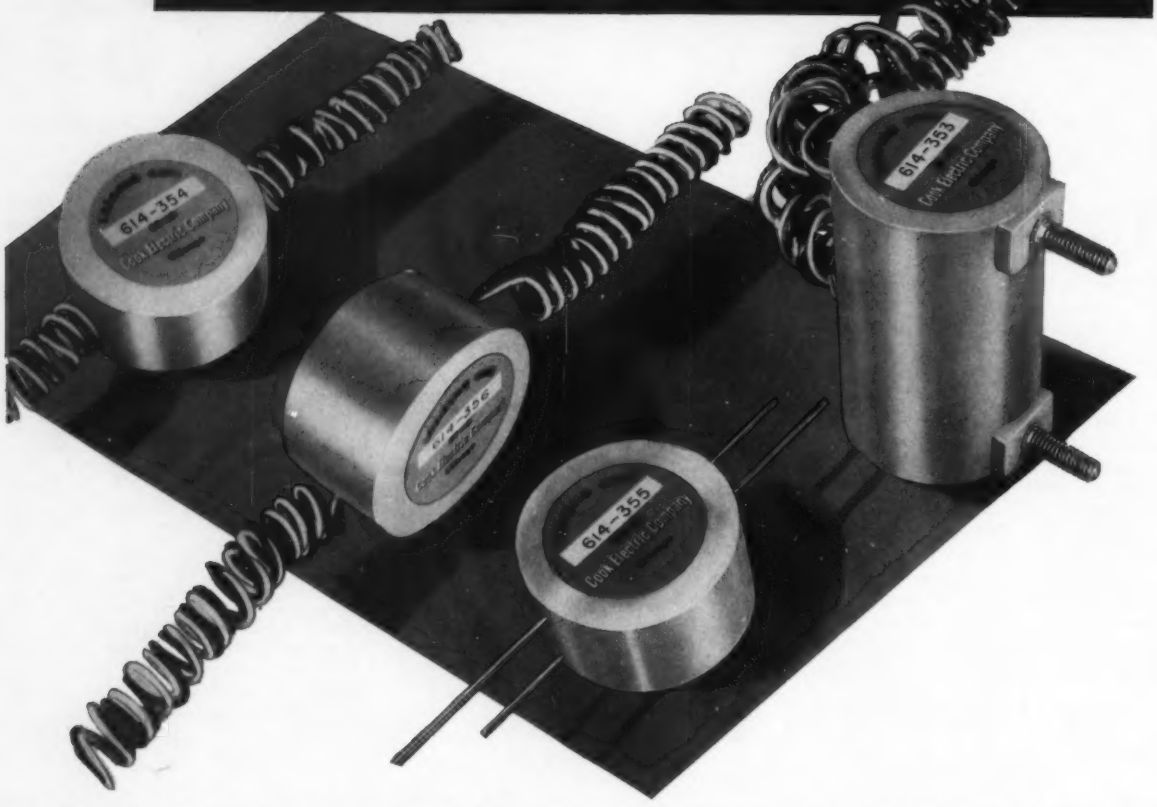

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Integrally molded Hi-Fi Coils insure positive moisture seal and high mechanical strength in smaller, more compact units. When furnished with stud mounting it now becomes possible to splice Hi-Fi Coils in a buried plant. Pigtails with REA approved color code plastic wire, permit easy identification of pairs. Improved insulation and winding techniques in Hi-Fi Loading Coils produce greater than a 10,000 volt dielectric strength and a minimum of one-half percent inductance unbalance.

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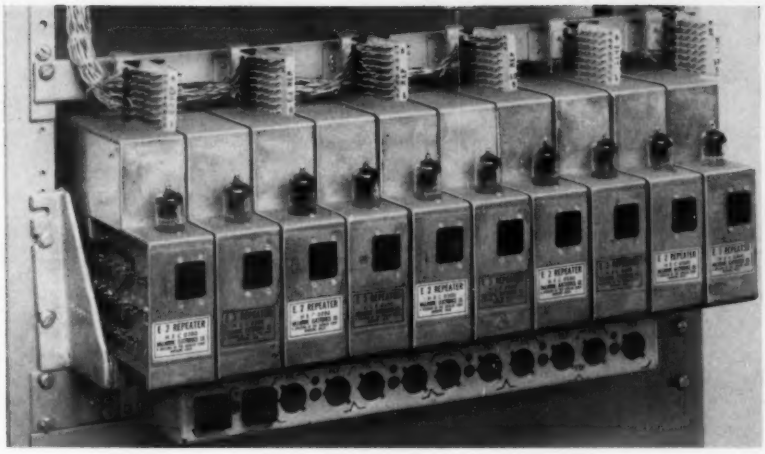

Fig. 2

have been manufactured to modern standards, and could erase expensive return loss improvement measures undertaken in outside plant.

It is very possible to have defects in the repeat coil or condenser which do not affect trunk operation, but seriously affect the return loss measurements. Certain trunk equipment lacks provision of repeat coils, and when such is the case, outside facilities must be used whose impedance matches that of the office.

On the shorter toll connecting trunks (less than 2 decibels), and on ordinary operator and service trunks, a 2 db pad must be placed at the toll office end to maintain a uniform return loss. Office cabling required to wire the circuit terminal to the switches or switchboard may change the input impedance of the circuit and since there are often lengthy amounts of cable in the various circuits involved, the office return loss may be seriously reduced. When this is found the capacity of all switching paths is adjusted to a uniform value by means of drop building out capacitors.

Once the terminal impedance is uniform on all paths through the central office the network building out capacitors can be properly adjusted. These requirements show why the multi-building switching center arrangement should be avoided to eliminate special transmission problems. The toll terminal equipment, dial switching system and toll switchboards should be in the same or adjoining buildings—not several blocks apart.

(3) *Terminating Trunks.* Terminating trunks (also called toll connecting trunks) are trunks connecting a Class 4 office with a Class 5 or end-office, which is the subscriber's local switching point. When inter-toll trunks switch at VNL the design objective for the toll connecting trunk is VNL + 2. The range of loss for the usual voice frequency loaded cable facility usually results in a loss ranging from 2.5 to 4.0 db. It is the improvement of this type trunk that most concerns the telephone industry today due to the large number involved (80 per cent of all trunks, or approximately two million, are in this category.)

It is essential that toll connecting trunks have high echo return loss and singing point values to support VNL switching. Measurements at the toll center with the trunk terminated at the distant local office in 900 ohms should be as follows:

	Average	*Standard Deviation*
Echo return loss	18 db	2.5 db
Singing point	10 db	2.0 db

Since plant engineered today will be with us for a long time, it is essential that all new facilities meet at least the average required values. Present thinking believes the following procedures mandatory in the provision of voice frequency facilities for toll connecting trunks:

(A) Maintain the close tolerances of the following standard load spacing rules. (Incidentally, many transmission people feel these guides are too lax and that the tolerances should not often be used.)

Average spacing within ± 2 per cent of nominal.
Maximum deviation within ± 2 per cent of average.
Average deviation from average spacing not over 5 per cent.
Average difference of deviation in two adjacent sections not over 2 per cent.

(B) Use capacitance deviation test splicing to overcome the effect of variations in cable capacitance.

(C) Mixtures of cable gauges should be kept to a minimum in order to avoid the impedance mismatches resulting from junctions of facilities of different impedances. It is difficult to determine at this time the amount of a second gauge that could be tolerated, however, it is known that effects of a second gauge are least when it is placed farthest from the toll office. Amounts up to about 800 feet can probably be tolerated. A difference in gauges of one size has been found to have less effect than a difference in gauges of two or more sizes. We know of at least one Bell operating company that uses artificial lines in its laboratory to duplicate any new proposed cable design. They have been very successful in predicting effects of various line characteristics.

(4) *Repeaters.* When needed on voice frequency facilities, they should be used at the distant end or at some intermediate point. Combination negative impedance repeaters employing both series and shunt units, as shown in *Fig. 2,* are used. Use of the series type repeater (E2) alone is satisfactory for non-toll connecting trunks, but when trunks are switchable to toll plant, echo considerations make necessary use of the shunt repeater (E3) also. The E type negative impedance repeaters have been found to have extremely stable gain—frequency characteristics. They require 48-volt and 130-volt battery, but new power supplies (ac powered, or a static unit that converts 48 v to 130 v) make it unnecessary to provide the conventional 130-volt battery plant in any but the very large installations.

Location of negative repeaters at the near end seriously reduces echo return loss. The author has seen installations of repeaters at the toll office cause such serious instability that the repeater installation had to be split up and moved to the outlying offices concerned. Results with an E2 and E3 repeater combination on this facility were as follows:

(a) *With repeaters at the toll office:*

	Measured Value	Desired Value
Return loss	10.2 db to 12.5 db	18 db
Singing point	4 db to 6 db	10 db

(b) *With repeaters at end office:*

	Measured Value	Desired Value
Return loss	17 db	18 db
Singing point	8 db to 11 db	10 db

The facility involved is approximately 11 miles of a mixture of 19, 22 and 24-gauge H88 loaded high capacitance cable with a 1,000-cycle loss of 7.4 db. A repeater strapping for 4.2 db was used. The effect of gauge mixture can be seen by the results even with the E2 and E3 combination at the far end though there was a marked improvement after the repeaters were relocated. During the tests a portable

(Please turn to page 42)

N. D. Independent Installs Dial Mobile Service

Fred Ahlgren, Manager of Reservation Mutual Aid Telephone Corp., looks over radio base station in transmitter shack at the base of the antenna tower in Parshall, S. D. Unit provides 50 watts RF power output. It is connected by wire lines to the terminal units in Parshall exchange.

Herb Stall, who maintains Reservation Mutual's radio system, checks termination chassis in the Parshall exchange.

THE COMBINATION of unattended dial exchanges and mobile telephone service is no longer impossible for the small Independent telephone companies, says Fred Ahlgren, manager of Reservation Mutual Aid Telephone Corp. of Parshall, N. D. Reservation Mutual, as the first company in North Dakota and one of the very first in the entire country to install fully automatic mobile dial equipment, will have 45 subscribers for its mobile service by the end of the year. The initial phases of its two systems went into operation on Mar. 15.

RMATC serves 2,500 subscribers through 13 unattended dial exchanges in the central North Dakota, farm, ranch and oil country around the Garrison Reservoir. The need for mobile telephone service became apparent to Mr. Ahlgren when the Williston Basin Oil field activity moved into his territory. To serve the oil industry, Northwestern Bell had established manual dispatch mobile telephone service in Williston and Tioga, N. D. As the oil field progressed south into Reservation's area, it moved out of consistent range of the Bell base stations.

In a survey conducted late in 1957, Mr. Ahlgren found 55 potential mobile customers in his territory. Many of these were oil field supply firms, such as those providing mud, perforating, and cementing service to the oil drillers. Others included his own service vehicles, ambulances and schoolbuses.

Mr. Ahlgren decided against a dispatch type service. He had already determined the need for two-base stations if he were to adequately cover his entire territory. Providing 24-hour operator service at two exchanges would be too costly. Only one of his prospects had indicated satisfaction with eight-hour service.

After approval of his REA loan on a system basis, Mr. Ahlgren placed his order with Motorola. This equipment, in active development since early 1957, can handle three "loops" (three 10-party lines) from the dial exchange on each radio base station. The two base stations with their respective first loops were installed early in 1959. Second and third loops at each exchange will be installed later this year.

The Keene exchange is located in the oil field region of Reservation's territory, so one radio base station was installed there. The second station went in at the Parshall exchange, Reservation's headquarters. The first Parshall subscribers include six Reservation vehicles—five service trucks and Mr. Ahlgren's car. Others include a school bus, a doctor, and a local electronic repair shop. At Keene, nine of the first 10 numbers went to oil fields. Two units are fixed on drilling rigs and the others are in vehicles of various drilling supply firms. The doctor on the Parshall exchange carries a two-frequency mobile unit and has an independent number on the Keene exchange as well. This enables him to receive direct calls from patients in a 90-mile long area without their paying any toll charges.

Selling the service to the oil field business men is no problem whatsoever, says Mr. Ahlgren. It costs about $250,000 to sink a well in North Dakota, he points out, so whatever time can be saved through a radio-telephone pays for the cost of the communications very easily.

The 20 additional numbers to be available at the Keene exchange later this year with the installation of the second and third loops will be sold immediately to others in the oil fields. Eventually, it may be necessary to set up an additional transmitter in this

area to increase capacity beyond 30, says Mr. Ahlgren.

At Parshall, the demand is not as heavy, he states. Seven more school buses are waiting for service and will be the first to get on second and third loops later this year. In the small city of Parshall (population, 1,200) there are not too many additional prospects, Mr. Ahlgren admits. He does have his eye on the local fuel oil dealers, however, and even the city police chief. He points out that the one-man police force's mobile radio is set to the county sheriff's frequency. With a mobile telephone in his car as well, Mr. Ahlgren said, local residents could call the chief directly when needed.

The fact that it may take some time to fill up the 30 subscriber capacity at Parshall does not worry Mr. Ahlgren. Figuring 10 years depreciation, he is able to prove out his investment with 20 subscribers at Keene and 15 at Parshall, including his own vehicles. With firm prospects for 45 customers total by the end of the year, he is convinced the investment will be profitable. Cost of the two systems with 45 mobile units approximates $70,000.

The mobile service rate has been fixed at $35 per month for units having a number on one exchange only and $45 per month for those desiring numbers on both exchanges. This requires a dual frequency unit and also ties up an additional exchange number. Besides the monthly fee, which entitles the subscribers to an unlimited number of calls, Reservation Mutual charges a fixed fee of $40 per unit installation and removal.

As for the six units in Reservation Mutual's own vehicles, Mr. Ahlgren says this equipment brings back more revenue than could possibly be taken in if the units were used by subscribers. He feels the ability to closely control his maintenance force which must cover a 3,500 square mile area reduces operating expenses by $4,800 annually through decreased mileage and added efficiency. He feels he will be able to gain further savings by being better able to watch materials. The telephone equipment maintenance crews will make great use of their new communications capabilities during the rough Dakota winters.

There is nothing revolutionary about the radio portion of the new equipment, according to Mr. Ahlgren. At the base station is a standard Motorola transmitter-receiver unit, each using its own 150-170 mc frequency and antenna. Different, of course, is the telephone (terminal units), the heart of the system which connects to a regular 10-party subscriber line. The three loop radio systems use three 10-party lines. The radio stations are housed, along with emergency power generators, in 8 x 10-foot steel buildings at their respective antenna tower sites. At the Parshall site, about one mile from the city, a 300-foot guyed steel tower supports the two high gain antennas. At Keene, where there is higher ground available, a 100-foot wooden utility pole serves as the tower. The site is about one-half mile from the exchange. The base stations are connected by wire lines to their telephone (terminal units) located in exchange buildings.

One of Reservation Mutual's linemen uses the pushbutton dial radio-telephone in his truck to place a call to one of the company's other trucks.

The mobile equipment consists of 25 watt Motorola "T-Power" radio units and the special pushbutton dial control heads. The "T-Power" units utilize transistors in the power supply. The radios operate from a 12-volt source.

Range of the two systems is about the same. Mr. Ahlgren reports consistent range of 35-40 miles, with distances as great as 55 miles covered when the mobile unit is on high ground.

Placing a call from a mobile unit is a simple matter. When a subscriber picks up his handset from its cradle, his radio transmitter sends out a tone signal to the base station. The base makes a connection to the dial telephone exchange and the subscriber hears the usual dial tone. He then presses the pushbuttons, which are labeled exactly like the digits in a standard telephone dial, in sequence to spell out the letters and numbers of the desired telephone number. For each pushbutton depressed, the mobile transmitter sends out a unique tone signal. The base station equipment receives these tone signals and converts them to dial pulses which are applied to the dial exchange line. For calls to the mobile units, the reverse procedure takes place. The ringing from the exchange is converted by the radio-telephone terminal units into corresponding tone modulated radio signals which are transmitted to all mobiles by the radio base station. Only the desired one is alerted and can answer.

The mobile station control head has three lights, as well as the pushbutton "dial." One light indicates the channel is in use ("busy"); the second indicates the mobile station has been called (backing up the ringing signal); the third indicates when the mobile station transmitter is on. When any one mobile phone on the radio channel is in use, all other receivers are locked out to insure privacy. There is a technique for breaking into the line, however, in case of an emergency.

To maintain the radio-telephone system, Reservation Mutual entered a contract with Motorola that provides regular preventive maintenance activity and whatever emergency service is needed. Motorola established an authorized

(Please turn to page 46)

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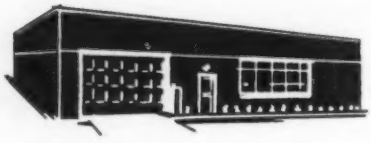

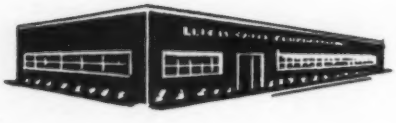

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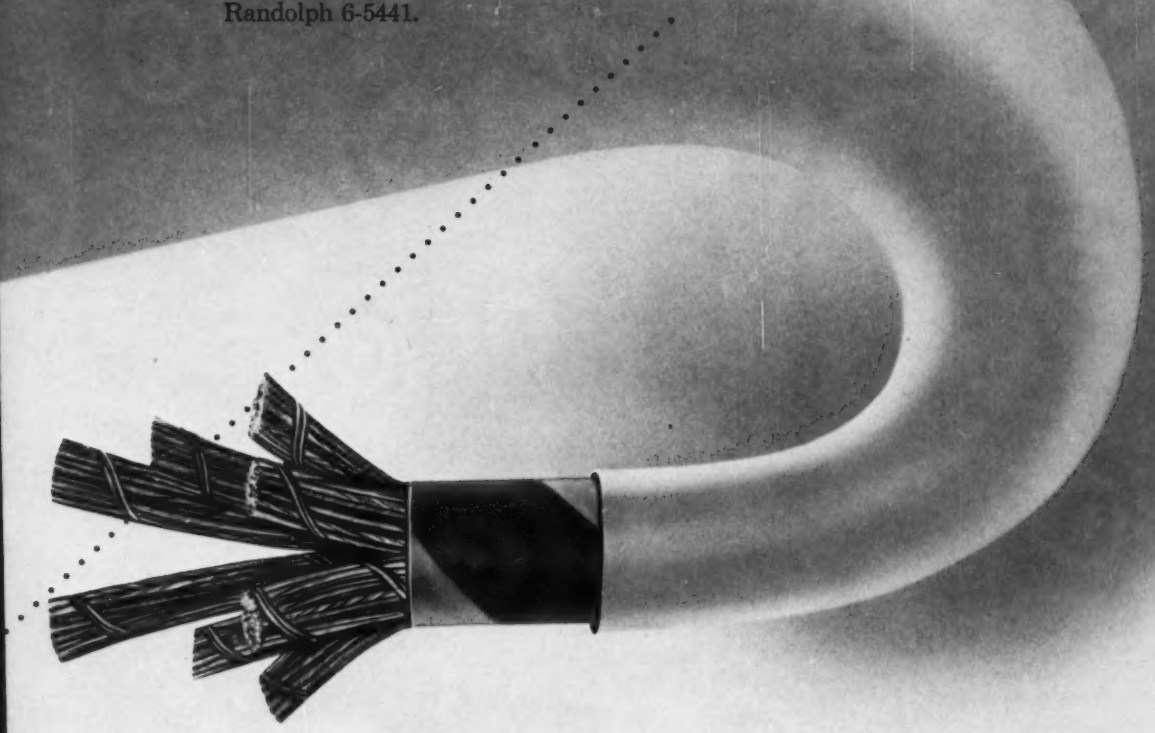

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Amplitude Modulation In Carrier Systems

By Arthur L. Albert

Part 2

IN A PREVIOUS article (TELEPHONY, Sept. 5) the use of varistors, such as copper-oxide and crystal diode rectifiers, for modulation in carrier-telephone systems was discussed. The general features were presented, and one circuit arrangement was described. This circuit produced an amplitude-modulated output wave containing the carrier and two sidebands.

In most carrier-telephone systems only one sideband is transmitted to the distant station, because each sideband contains all the information in the conversation. Components in the output of the modulator that are unwanted are removed by filtering. Because the carrier component in the output of the system previously described is of large magnitude compared with the sidebands, and because the frequency of the carrier is close to that of the sidebands, filtering is a problem. Filtering would be simpler if the carrier component did not exist in the output of the modulator.

In the first system now to be described, the component of carrier frequency is negligible in the output of a well-designed modulator. The output wave contains the two sidebands and a voice-frequency component. In the second system that will be discussed, the output wave contains *only* the two sidebands; neither the carrier nor the voice components exist in the output.

Balanced Bridge Varistor Modulator

The balanced bridge varistor modulator is shown in *Fig. 4*. This is merely *Fig. 2* (TELEPHONY, Sept. 5) with the connections of the voice and carrier sources interchanged. As for the circuits considered in the preceding article, the assumption is made that the magnitude of the carrier voltage is large compared with the magnitude of the modulating voice voltage. As before, it will be assumed that the carrier voltage controls the switching of the circuit, causing the resistance of the varistor units to vary between zero and infinity depending on the instantaneous polarity of the impressed carrier voltage.

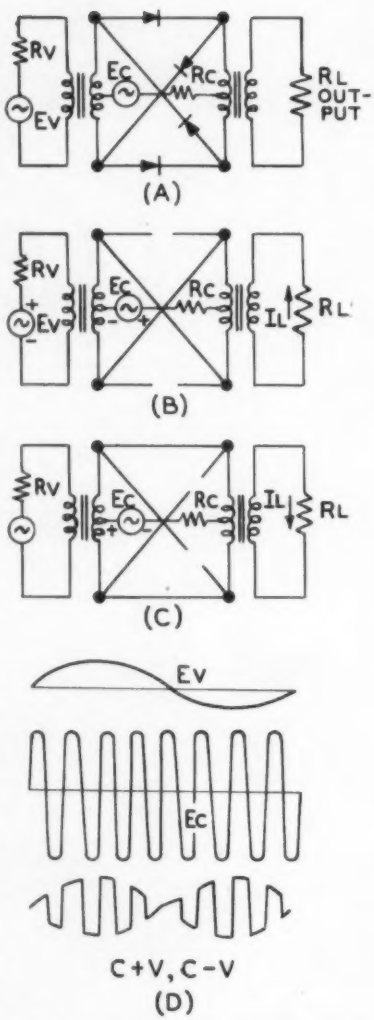

Fig. 4. The output consists mainly of the voice and two sidebands.

When the carrier voltage E_c has the polarity of *Fig. 4B*, the varistors all are "opened," and the audio voltage E_v sends current I_L through the load resistor R_L. For the next half cycle when the carrier voltage has the polarity of *Fig. 4C*, the varistor units are in effect "shorted," and since this short circuit is between E_v and R_L, the load current will be zero. The current through R_L will be as shown in *Fig. 4D* and will consist of an upper sideband C + V of frequency $f_c + f_v$, a lower sideband C — V of frequency $f_c - f_v$ and a voice-frequency component V of frequency f_v. Because the carrier source E_c always is either isolated by the "opens" as in *Fig. 4B*, or short circuited as in *Fig. 4C*, no carrier component exists at R_L.

Equations showing that sidebands do exist can be found as in the preceding article. To find the transfer resistance, assume that E_v is a constant direct voltage. Then, when the carrier voltage E_c is, as in *Fig. 4B*, the current I_L through the load resistor R_L will be $I_L = E_v/(R_v + R_L)$, and when the carrier voltage has the polarity of *Fig. 4C*, I_L will be zero. Thus, the shape of the current wave, and of the resistance and conductance waves, will be as in *Fig. 5*. This wave will have an average, or direct-current value, which is one-half the maximum value; that is,

$I_L = E_v/[2\ (R_v + R_L)]$. Hence, the transfer resistance is $R_T = 2\ (R_v + R_L)$, and the transfer conductance is $G_T = 1/R_T = 1/[2\ R_v + R_L)]$.

In addition to the average, or direct, component G_T just discussed, the wave of *Fig. 5* must contain "square-wave" variations (as in *Fig. 3* of the preceding article) to cause the instantaneous value to be either twice the average value, or a zero value. Referring to the equation for a square wave given in the preceding article, the equation for the admittance "wave" of *Fig. 5* is

$$g_t = G_T + \frac{4G_T}{\pi}(\sin \omega_c t + \frac{1}{3}\sin 3\omega_c t + \cdots)$$

The term $\omega_c = 2\pi f_c t$ was used because the circuit is being switched at the carrier frequency rate f_c.

Only the first two terms of this equation need be used to show the existence of sidebands. In modulation, E_v is *not* a constant voltage as previously assumed, but is an alternating voltage of instantaneous value $e_v = E'_v \sin \omega_v t$. The current output of the modulator of *Fig. 4* is $i_L = e_v g_t = (E'_v \sin \omega_v t)(G_T + \frac{4G_T}{\pi}\sin \omega_c t)$, or $i_L = G_T E'_v \sin \omega_v t + \frac{4G_T E'_v}{\pi}(\sin \omega_v t \sin \omega_c t)$.

The first term of this equation indicates that the current i_L in the output resistor R_L contains a voice-frequency component. The second term, when the trigonometric substitution $\sin \omega_v t \sin \omega_c t = \frac{1}{2}\cos(\omega_c - \omega_v)t - \frac{1}{2}\cos(\omega_c + \omega_v)t$ used in the preceding article, is made, shows that two sideband current components exist. After multiplying current components by R_L to give voltages, and substituting the resistance values for G_T, the equation for the voltage output of the modulator of *Fig. 4* is

$$e_L = \frac{E'_v R_L}{2(R_v + R_L)}\sin \omega_v t + \frac{E'_v R_L}{\pi(R_v + R_L)}\cos(\omega_c - \omega_v)t - \frac{E'_v R_L}{\pi(R_v + R_L)}\cos(\omega_c + \omega_v)t.$$

Since $\omega = 2\pi f$, the first term is the modulating voice frequency f_v, the second term is the lower sideband of frequency $f_c - f_v$, and the last term is the upper sideband of frequency $f_c + f_v$.

Experimental Verification

Using components selected at random as explained in the preceding article, the circuit of *Fig. 4* was connected to verify the equations just derived. All resistance values were 600 ohms, E_c was 3,500 cycles and an r.m.s. value of 8.0 volts, and E_v was 500 cycles and 1.0 volt r.m.s.

From the equation, the magnitude of the audio voltage across R_L should be $(1 \times 600)/[2(600 + 600)] = 0.25$ volt. Measurements with a wave analyzer gave the audio component across R_L to be 0.28 volt. The magnitude of each sideband should be $(1 \times 600)/[\pi(600 + 600)] = 0.16$ volt. Measurements with a wave analyzer gave 1.2 volt. Closer agreement for the magnitudes of the sidebands would be preferred but several assumptions made in the derivations, and the fact that the circuit elements were selected at random, no doubt influenced results.

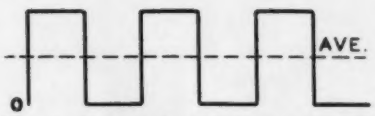

Fig. 5. Current I_L and the transfer resistance and conductance contain an average value.

The output of the unbalanced bridge varistor modulator of the preceding article contained three major components—a carrier component, and upper and lower sidebands. The output of the balanced bridge modulator just described contained three major components—an audio component, and upper and lower sidebands. Thus the unbalanced bridge modulator suppresses the voice and transmits the carrier, and the balanced bridge modulator suppresses the carrier and transmits the voice. The system now to be described *suppresses both* the voice and the carrier components; the output contains *only* the two sidebands as major components.

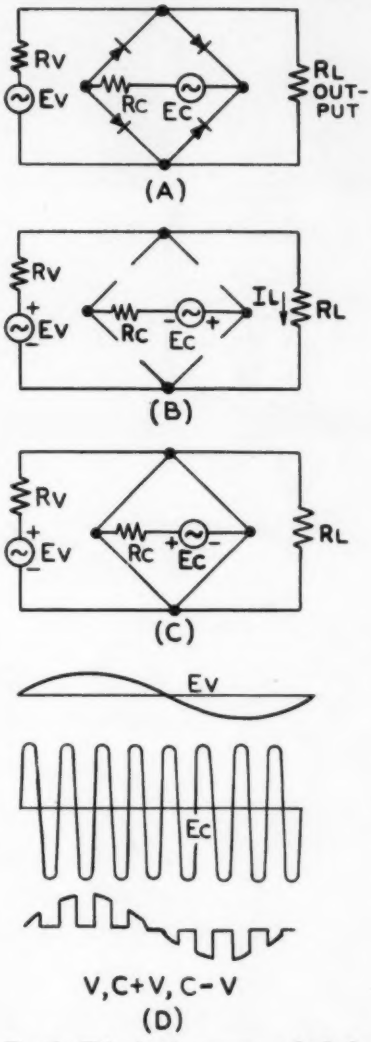

Fig. 6. This circuit suppresses both the voice and the carrier. The two sidebands are the main components in the output.

Lattice or Ring Modulator

In the lattice, or ring, modulator of *Fig. 6*, the carrier voltage E_c is much larger than the modulating voice voltage E_v, and again, the carrier voltage is assumed to control the circuit switching. The discussion also will assume that the transformers are ideal and that they have no effect on the magnitudes of the currents and voltages.

Figs. 6B and 6C show the equivalent circuits for the positive and negative half cycles of carrier voltage. Because of the carrier switching action, the current I_L that the voice voltage forces through load resistor R_L is caused to vary in direction at the carrier-frequency rate as shown in *Fig. 6D*. The voltage across R_L will have the same wave shape as the current through R_L. An analysis of this wave shows that it contains only the two sidebands. The carrier voltage *will* force a current component of carrier frequency around the two loop paths always existing. However, equal carrier-current components will exist in opposite directions in *each* half of a transformer winding, and hence negligible resultant carrier voltages will exist in the other transformer windings. No resultant voice-frequency component exists in the output because the circuit is switched, giving the output wave shape of *Fig. 6D*.

It is of interest to compare the output waves of *Fig. 4D*, which *does* contain a voice-frequency component, and *Fig. 6D*, which *does not* contain a voice-frequency component. The argument *might* be presented that the output wave of *Fig. 6D* contained two voice-frequency components that were 180° out-of-phase and, hence, cancelled each other giving no resultant voice component in the output.

Equations showing the existence of sidebands readily can be derived as for the previous modulators if the transformers are assumed to have no effects as previously mentioned. However, because most transformers would have considerable influence on results, these equations have not been included.

(Please turn to page 45)

Around the clock with your bedroom phone

9:30 a.m. A friend calls while you're straightening up the bedroom. How easy it is to reach for that nearby phone instead of running down the hall or the stairs! (And you can talk in complete privacy.)

2:15 p.m. Signs of a cold send you to bed. Your telephone couldn't be handier, or more useful. You can call the doctor or the drugstore, keep in touch with friends, have household business at your finger-tips. And all this convenience is pleasantly low priced.

The busy day of a

Is a bedroom extension phone useful only at night?

By no means, as these pictures and their storytelling captions demonstrate. They're from a Bell System advertisement running this month, in full color, in *American Home* and *Better Homes and Gardens.*

3:30 a.m. You sleep better through the night because you know that your bedroom phone is ready to summon ambulance or doctor, police or firemen. (If you wish, a dial light glows softly while you sleep—brightens when you lift the receiver. This feature is optional.)

Around the clock your bedroom extension telephone serves you well and costs surprisingly little. You can order one in the decorator color you like by calling your local Bell Telephone business office.

BELL TELEPHONE SYSTEM

bedroom phone

When you stop and think about it (which is what we want people to do), bedroom phones lead very busy lives being helpful.

And just as bedroom phones are useful throughout the day, so this advertising is useful in building sales for telephone companies throughout the country.

BELL TELEPHONE SYSTEM

Impact of Telephone Communication

On the Economies of the Various Geographic Regions of the U. S.

By ALEXANDER I. WARRINGTON

PART IX: Region 9. Alaska and Hawaii.

ALASKA was acceded to the United States in 1867 and Hawaii in 1898, and both became states in 1959. The territorial status of Alaska continued for 92 years and that of Hawaii for 61 years.

While the area of Alaska is nearly 100 times (91.5) greater than Hawaii, the population of Hawaii is nearly four (3.9) times that of Alaska.

At Juneau the daily average temperature throughout the year is 42.5 degrees F., while that of Honolulu is 75.2, a difference of 32.7 degrees.

At the turn of the Twentieth Century rapid communication changed basic concepts of trade and industry in the United States and these changes quickly penetrated the American territories and possessions. The telephone was becoming an integral part of the so-called American way of life to such an extent that foreign visitors were apt to notice this phenomenon more than Americans who accepted the telephone, the bathtub, and electric lights as routine.

Patterns of life, which included the telephone as a social and economic necessity, and never as a luxury, have quickly been adopted in American territories and possessions, and this is one of the foremost reasons why the relatively short territorial periods for Alaska and Hawaii culminated in the enthusiastic adoption of the two former territories into the family of the United States of North America. (Henceforth the use of the term, United States of North America, will be more acceptable to our friends south of the border where the term "United States" is also in use.)

Hawaii has something like 177,000 telephones for a population of a little more than one-half million, and Alaska probably has about 211,000 persons with around 36,000 telephones.

Salmon, gold, copper, and furs from Alaska have been integrated in America's economic machine and so have sugar and pineapple from Hawaii. This major economic achievement has required, and continues to require, a tremendous amount of planning and great as that has been in the past, it is as nothing compared to what the future will require. The telephone and all kinds of economic planning are so closely knit as to be inseparable, and the telephone has become accepted with very little drama in economic planning and many allied fields, since it is regarded as basic and as vital to modern life as water is to all living things.

Even so, a little exploring is interesting. Suppose, for example, we analyze various types of economic systems and compare them with our own. So as to avoid international complications we will refer to various countries as Nations A, B, and C. Nation A has an economy equal to that of the United States in 1959. Nation B has an economy equal to the United States in 1925-30, and Nation C equal to the United States in 1900-10. (The analysis has actually been made.)

Here is what was found:

(1) As of 1959, telephone service of Nation A is equal to and, in some respects, even superior to that of the United States.

(2) As of 1959, telephone service of Nation B is not equal to what it was in the United States in 1925.

(3) As of 1959, telephone service of Nation C is so highly selective and limited that it corresponds roughly to what the United States had in 1900 to 1920.

Alaska and Hawaii are both in Time Zone 2 which is the Pacific, and this is a significant observation with respect to geographic location.

Alaska

Juneau is the capital of Alaska and the First Judicial Division; Nome is capital of the Second Judicial Division; Anchorage is capital of the Third Judicial Division; and Fairbanks is capital of the Fourth Judicial Division.

Retail sales are running at about 190 million dollars yearly and follow this pattern:

All retail sales	100.0%
Food stores	23.7
Eating and drinking	13.8
General merchandise	13.6
Apparel and accessories	6.9
Furniture and household furnishings	4.3
Automotive	13.2
Gasoline and service	5.4
Lumber and related (including farm equipment)	4.6
Drug and proprietary stores	4.2
Miscellaneous and unclassified	10.3

There are over 500 farms in Alaska with an average acreage of 800 or more and the average value of land and buildings is close to $15,000.

Anchorage is the main business center with a population of about 30,000. The principal manufacturing in An-

(Please turn to page 44)

THE Plant Man's Notebook

BY RAY BLAIN, TECHNICAL EDITORIAL DIRECTOR

THERE is an urgent need in the communication industry for continuous ac power.

By this we mean that when commercial power fails, emergency generators that take over the load without the loss of even one cycle are needed.

This is especially necessary on communication systems where equipment is synchronized. When this equipment gets out of synchronism, due to power failure, the system is down until it can be synchronized again. This delay often proves serious as it may cause service interruptions.

There are various types of continuous power equipment available, although many of these are not of adequate capacity to meet the needs of large communication systems. One of these types has a large flywheel that runs at high speed and maintains the speed of the alternator until a gas engine generator can start, get up to speed, and take over the load.

Another small system makes use of a 110-volt storage battery that operates a motor-generator to carry the load while a gas engine generator gets up to speed.

The provision of continuous power is admittedly a difficult problem when a heavy load is required. There is no doubt, however, that it will be successfully solved in time like all problems that the communications industry has ever faced.

•

The Chesapeake & Potomac Telephone Co. of Washington, D. C., now has six direct dialing codes in use to PBX telephone systems in various government agencies. This new service permits callers from the outside to bypass the PBX switchboards and to dial extensions directly.

The new codes and the agencies they serve are: OX, Defense Department; WO-4, Treasury, including Bureau of Engraving and Printing, and Bureau of Internal Revenue; DU-3, State Department; DU-2, Lafayette building, serving various government agencies; DU-8, Agriculture Department; and DU-6, General Accounting Office.

Here's an example of how to use this new service. If a call is to be made to someone at the Defense Department who has extension 54825, the caller dials OX-54825.

New direct dialing codes will be provided for the Veterans' Administration and General Services Administration offices early in 1960.

•

The speakerphone, or no-hands telephone, has not had the public acceptance predicted for it. Some of the earlier models were not entirely satisfactory, and this is perhaps one reason why it has not come into more general use.

Satisfactory instruments are now on the market and there is an indication that their use will increase to meet special needs, as required.

•

A new Bell Laboratories development, called TASI (Time Assignment Speech Interpolation will make it possible to double the number of conversations carried by existing undersea cables.

Each trans-oceanic telephone conversation is carried over a pair of channels. This is also true of most long distance calls. With this system, the users, alternately speaking over one channel and then listening over the other, can presently keep any one channel in use less than half the time.

TASI will, in effect, break up this pairing by permitting the channels in one direction to carry traffic independently of channels in the opposite direction. The new system will interlace spurts of active speech from any or all talkers on one side of the ocean to fill the voids in the transmission paths. At the other end of the cable, TASI will sort out the phrases and send them to the proper listeners.

Like a speedy operator, the system will disconnect a talker from the transmission path, but only for the short period he remains silent. Simultaneously, TASI will connect in his place another caller who is just beginning to speak. When the silent caller resumes speech, he will instantly be connected with another channel where someone else has paused with a break in the conversation.

It is claimed that rarely will the interval in which a channel is not open be long enough to be noticeable to the listener.

•

We observed a paging system installed in a new hospital recently which cost a large amount to install but is being discarded as useless. This system consisted of colored lights that flashed a code after first sounding a chime to attract attention. It seems that doctors and others paged failed to read their codes from the flashing lights. This happened after the chimes were disconnected as they caused noise that could not be tolerated in a hospital.

Voice-paging systems are also generally ruled out for hospital use due to noise. It appears that the only satisfactory paging system for a hospital is a radio system. A code wheel is started on a transmitter and a buzzer is sounded in a receiver about the size of a package of cigarettes that is carried by the doctors. On one system they then call a designated number from the nearest telephone and are connected with the calling party.

•

The writer recently enjoyed a visit from E. L. Love and J. A. Brazee, of the Whitney-Blake Co. They gave us a demonstration of a new method of locating cable trouble using a new test set developed by their company.

FOR EVERYTHING YOU NEED

Kellogg is close by with fast, dependable

Nuts, bolts, cable, terminals, batteries... you'll find everything it takes to run a telephone company under one roof at Kellogg. Eight completely stocked, conveniently located warehouses are only a phone call away. And when you call Kellogg you're talking with trained, experienced telephone men who understand your needs, know exactly what you require. For telephony's most complete source of dependable equipment, such as shown on these pages, and fast, efficient service... call your Kellogg representative.

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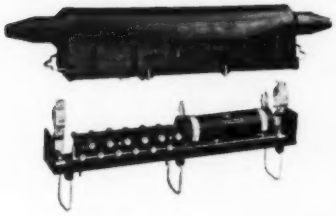
CHICAGO, ILLINOIS

Kellogg Switchboard and Supply Company
6650 South Cicero Avenue, Chicago 38, Illinois
Communications Division of
International Telephone and Telegraph Corporation

Splicer's Tone is a versatile instrument for the splicer. It has two tone circuits, a buzzer circuit, and a battery circuit for talking. Compact, only 12" long, 5" wide, 7" high, comes with handy carrying strap. Made by CABLE SPINNING EQUIPMENT COMPANY.

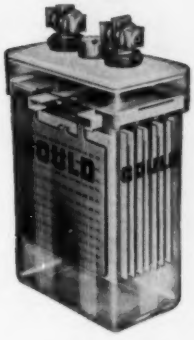
Model B Howler—For eliminating service calls due to misplaced receiver. Produces distinctive signal tone, demanding attention; loud, yet safe. Equipped with subscriber controlled relay for fully automatic operation. LORAIN PRODUCTS CORPORATION.

Dependable Power! Hundreds of telephone exchanges throughout the world attest to the low first cost, low operating cost, and thoroughly dependable service of Electrox Battery Eliminators and Chargers. Made by the SCHAUER MANUFACTURING CORP.



CEECO Type CP16 Non-Protected Ready Mount Terminal Assemblies—for all types direct buried plastic wire and cable terminals, CEECO LUG-3 Parkway Terminals, and all popular plastic cable splicing terminals. Use with CEECO Type C152 Ready Mount Load Coil Assemblies. Available in 1, 2, 6, 12 and 16 pair Terminal Assemblies. C152 cases contain from 1 to 26 loading coils. COMMUNICATION EQUIPMENT & ENGINEERING COMPANY.

Crapo Pretied Splints can be attached to insulator on the ground. Easy to install. Save time and labor. Permit resagging line wire without removing tie wire. Produced for galvanized steel and copper/steel telephone line wire. INDIANA STEEL & WIRE COMPANY, INC.



Outstanding Battery Performance is yours when you choose Gould Plante Batteries. Thick, grooved, pure lead positive plates give many years of trouble-free service! Made by GOULD-NATIONAL BATTERIES, INC., the finest money can buy.

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Cook 3C Protector Blocks. These versatile units are used for terminating and protecting cable pairs selectively by inserting Cook Minigap arresters. Furnished in 3, 6 and 16 pairs, combinations of 9 and 12 pairs can also be used for terminating cable.
COOK ELECTRIC COMPANY

Double-Groove Transposition. Insulator (No. 56) is employed for all circuits (exchange, toll, or trunk circuits) that employ tandem type transpositions. The test of time has proved the high quality of these Hemingray Insulators—a product of OWENS-ILLINOIS.

Courts and Commissions

Denver Directory Omission Leads to $65,000 Suit

Mrs. Elizabeth Fine Striker, owner of Reliable Sewing Machine Co., Denver, on Aug. 27 sued Mountain States Telephone & Telegraph Co. for $65,000 in Denver District Court for omitting the Reliable Sewing Machine name and ad from the directory yellow pages.

The suit charged breach of contract. Mrs. Striker claimed her company has suffered loss of business as a result of the omission and that trade normally obtained by telephone has "considerably diminished." She contended a contract for the ad was made last March.

Interim, Dial Rates Granted Wis. Company

The Wisconsin Public Service Commission recently granted an interim rate increase and a raise effective on cut-over to the Hillsboro Telephone Co., Inc., according to an announcement by George J. Hammer, Hillsboro's secretary-treasurer (TELEPHONY, Apr. 18).

The new rates will raise operating revenue from $42,522 to $44,031.

Net operating income will be increased from $4,252 to $9,579 after conversion to automatic operation is effected. At that time, the company's rate base will rise from $108,151 to $252,543.

Old, interim, and automatic rates are as follows:

	Old	*Interim*	*Automatic*
One-party business	$6.50	$7.75	$9.00
Two-party business	5.50	6.25	7.50
Multi-party business	4.50	4.80	5.75
One-party residence	5.00	5.60	6.25
Two-party residence	4.25	4.60	5.25
Four-party residence	3.30	3.55	4.25
Multi-party residence	3.50	3.80	4.50

Seek EAS Approval in Fla.

The joint application of Southern Bell Telephone & Telegraph Co. and Quincy Telephone Co. to provide extended area service—between Southern Bell's Havana exchange and the latter's Quincy exchange—was scheduled by the Florida Railroad & Public Utilities Commission for a hearing on Sept. 23.

Indict Three Minnesotans For Directory Mail Fraud

Three Minnesota men are reported to have been indicted by a federal grand jury and charged with mailing statements to various business houses in Ohio and Indiana "purporting to be bills for advertising in the yellow pages of local telephone directories."

H. Donald Hawkins, assistant United States district attorney of Dayton, O., is prosecutor. The Ohio indictment says $200,000 was collected in that state alone since 1958.

Postal authorities investigated the firm, "Directory Advertising Listing Co." after the firm and its officers sent its statements out over wide areas including Minnesota, Iowa, Ohio, and Indiana.

The three men, who are accused of soliciting money for a so-called "Buyers Guide" are Frederick W. Thorne Jr. of St. Paul, president of the company; Paul A. Baber of Roseville, vice president, and Robert Kandler of Mendota Heights, secretary-treasurer.

U. S. Attorney Hawkins said, "The solicitations were printed in such a manner as to appear to be invoices from telephone companies. Fine print disclosed that the firm actually had nothing to do with telephone companies and that the advertisements were to be published in a 'Buyers Guide.'" Hawkins said the guide was never published.

In a similar case in Illinois, a Nov. 4 date has been set for the trial of United States vs. Oleck.

Stanley Oleck of New York, owner of the Directory Publishing Co., was indicted by a federal grand jury which investigated a Greater Chicago Business Classified Directory published by Mr. Oleck.

The private directory listed the names of Chicago area businesses and executives. The grand jury, investigating mail frauds, indicted Oleck for soliciting ads on mail forms similar to those used for the Chicago classified telephone directory published by the Reuben H. Donnelley Corp.

N. Y. Telephone Man Saves 2 10-Year-Olds From Drowning

Quick-thinking by a Lockport, N. Y. telephone repairman was credited with saving the lives of two 10-year-old boys. They had fallen into 15 feet of water in the Barge Canal.

The telephone man, Charles Taylor, was working near the canal when he heard the cries of David Wertman and Robert Steinkohler. Both are non-swimmers.

They were floundering in the water when Mr. Taylor tossed them a rope, part of his equipment. He hauled on one end and the boys, clinging to the other, managed to reach bushes along the steep bank.

Hear Sale Bid in Wisconsin

The Wisconsin Public Service Commission on Aug. 27 was to hear the joint application of the Elroy Telephone Co. to sell and the North-West Telephone Co., Tomah, to buy the Elroy company. The Elroy exchange has been operated by Scott Huntley since he purchased it in 1920. North-West company serves 19 exchanges and plans to convert Elroy to automatic operation.

OK Raise, Bonds in Ind.

The Garrett Telephone Co., Inc., on Aug. 21 was authorized by the Indiana Public Service Commission to raise rates and to issue $200,000 worth of bonds (TELEPHONY, Mar. 21).

Kan. Company Names Mgr.

Roland W. Mars has been named general manager of the Northern Kansas Telephone Co., Ottawa, it was announced recently by the board of directors. Mr. Mars had been serving as Rural Electrification Administration telephone division field representative in the Pocatello, Ida. area.

45 Attend USITA Telephone Engineering Conference

The USITA's third annual Telephone Engineering Conference drew 45 Independent telephone men to Michigan State University, East Lansing, for a three-week study (June 28-July 17) of economics and the science of money, in addition to traditional telephone engineering subjects.

The United States Independent Telephone Association, through its Subcommittee on Engineering Education, and Michigan State's College of Engineering cooperated with the MSU Continuing Education Service as sponsors of the course.

Studies at the university's Kellogg Center are reported to have revolved around economic concepts, the relationship of earnings to capital requirements, and the necessity of coordination between all company departments, including the building, commercial, cost, equipment, plant, production, traffic, transmission and sales engineers.

Conference officials, taking note of the indicated rate of growth of the telephone industry, and of the fact that telephone engineers are heavily responsible for meeting the public's demands for the best service, set up the following four major segments of telephone engineering for study:

Cost considerations in engineering decisions.
Fundamental economic concepts.
Engineering fundamental plans.
Communicating engineering decisions.

Dr. Charles C. Killingsworth, director of the MSU Labor and Industrial Relations Center; Dr. John R. Ryder, dean of the MSU College of Engineering, and Dr. Anatole R. Gruehr, head of the department of economics and history, Polytechnic Institute of Brooklyn, N. Y., were among the program leaders and consultants.

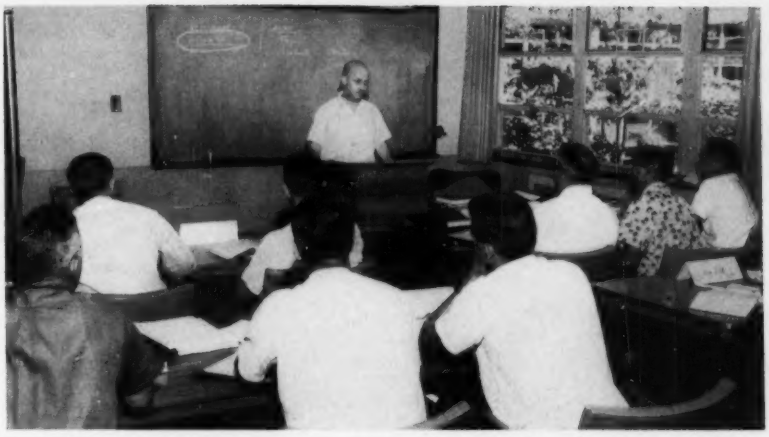
Members of the USITA Subcommittee on Engineering Education, who cooperated with Michigan State in staging the conference, are: R. J. Loveland, of San Francisco, Cal., director; Paul H. Henson of Kansas City, Mo., and I. B. Jackson of New York City.

Participants in the course were:

Section I:

Ray J. Alter, Intra State Telephone Co., Galesburg, Ill.; James Corbett, Southeastern Telephone Co., Tallahassee, Fla.; Richard P. Decker, General Telephone Co. of Florida, Tampa; James C. Friederichs, General Telephone Co. of Wisconsin, Madison; Donald P. Greenland, General Telephone Co. of Ohio, Marion; Harold H. Hagen, General Telephone Co. of California, Santa Monica; George W. Hall, General Telephone Co. of the Southwest, San Angelo, Tex., and Norman H. Loseke, General Telephone Co. of Nebraska, Columbus.

Also in Section I: Leo P. McGuire, West Coast Telephone Co., Everett, Wash.; Hugh Pulliam, General Telephone Co. of the Southeast, Durham, N. C.; Wayne W. Putnam, California Water & Telephone Co., Monrovia, Cal.; Charles R. Robison, General Telephone Co. of Southwest; Donald K. VanDyke, General Telephone Co. of Michigan, Muskegon; Jack F. Wegforth, California Interstate Telephone Co., Victorville, and Milton E. Wilson, Home Telephone Co. of Ridgway, Pa.



Anatole R. Gruehr, professor of economics and head, department of economics and history, Polytechnic Institute of Brooklyn, lecturing to a USITA Telephone Engineering Conference class on the subject: "Cost Considerations in Engineering Decisions." The class was part of a three-week course recently concluded at Michigan State University.

Section II:

John M. Becker, Hawaiian Telephone Co., Honolulu, Hawaii; Stuart Biery, Middle States Telephone Co. of Illinois, Des Plaines; Don R. Bradley, Intra State Telephone Co.; Maurice H. Esperseth, General Telephone Laboratories, Inc., Northlake, Ill.; Bobby J. Gothard, General Telephone Co. of Pennsylvania, Erie; John Hall Jr., General Telephone Co. of Southeast, and Leslie B. Harmer, Bermuda Telephone Co. Ltd.

Also in Section II: Allen W. Hughes, General Telephone Co. of Michigan; James A. Lancaster, The Southwestern States Telephone Co., Brownwood, Tex.; Gerald P. Lockhart, British Columbia Telephone Co., Vancouver, Canada; John J. Lyons, General Telephone Co. of Wisconsin; Herbert K. Miller, General Telephone Co. of Indiana, Fort Wayne; Raymond Soard Jr., General Telephone Co. of Kentucky, Lexington; J. D. Tuck, General Telephone Co. of Southwest, and Thomas W. Wright, General Telephone Co. of Illinois, Bloomington.

Section III:

James Andrew Arnold, General Telephone Co. of Florida; Robert D. Ator, The Southwestern States Telephone Co.; Thomas O. Brock Jr., Harrisonburg (Va.) Telephone Co.; Ralph Driskill, Northeastern Telephone Corp., London, Ky.; Adam E. Horn, General Telephone Co. of Pennsylvania; Joseph P. Jallits, General Telephone Laboratories, Inc.; Merle K. Kessel, General Telephone of Illinois, and Kenneth M. Kilburn, Jamestown (N. Y.) Telephone Corp.

Also in Section III: James C. King, California Water & Telephone Co.; John C. Mau, General Telephone Co. of Michigan; John Blaine Noggle, Virginia Telephone & Telegraph Co., Charlottesville, Va.; Merritt Scharnweber, General Telephone Co. of Iowa, Grinnell; George H. Sherer, Illinois Consolidated Telephone Co., Mattoon; Joseph L. Siegley Jr., General Telephone Co. of Ohio, and James C. Watkins, General Telephone Co. of the Southwest.

Safety Showmanship Booklet Second Edition Available

A way to inject fun, color and showmanship into your industrial safety program — that's how the National Safety Council describes its new, 96-page, illustrated booklet, "Showmanship in Safety."

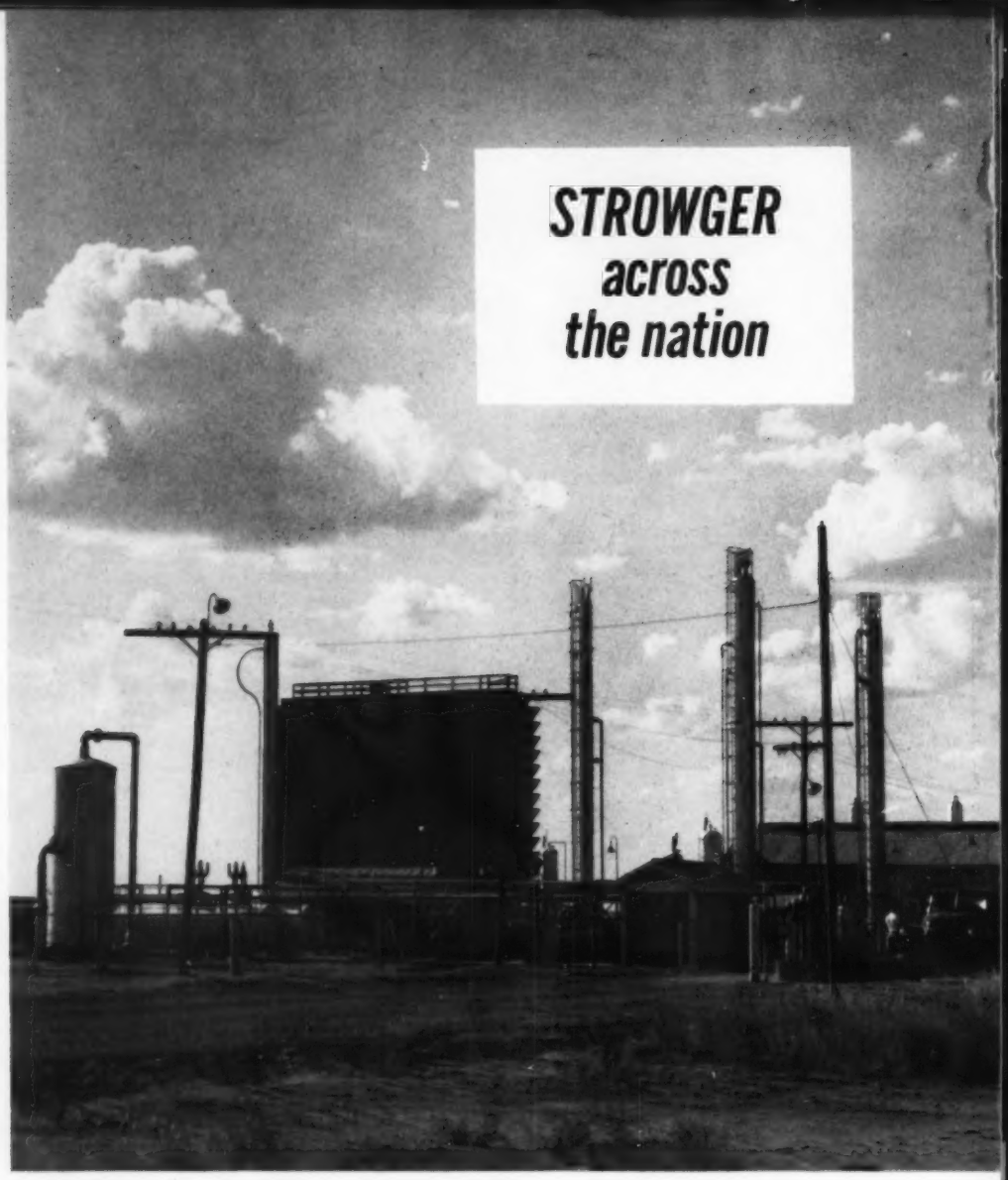
"This all-new second edition of the booklet," the Council says, "gives you the key to a successful safety program.

"Each page contains ideas for stunts, demonstrations and promotions that will help build interest, create favorable attitudes and bring a change of pace and a dash of color into your safety efforts."

For further information on "Showmanship in Safety," and quantity prices, contact the National Safety Council, 425 Michigan Ave., Chicago 11, Ill.

Empty Talent

"No talent, no self-denial, no brains, no character, is required to set up in the grumbling business; but those who are moved by a genuine desire to do good have little time for murmuring or complaint."—ROBERT WEST.



GASOLINE PLANT (one of many) processing natural gasses from Electra oil wells. All of the facilities for drilling, processing and transporting oil are in Electra. Scientific recovery programs are revitalizing old oil wells. And a continuing search for new sands has resulted in the opening of many new wells.

ELECTRA, TEXAS

An April Fool's Day gusher proves real and sets off a boom that turns a cowtown into the oil capital of Northwest Texas

Ten miles from the famed Red River, on the western edge of Wichita County, is Electra, Texas. Originally, Electra was a cowtown and trading post. On April 1, 1911, the day of a Trades Day celebration, word spread through town of an oil gusher. Many people, thinking it a promotional stunt for the celebration, yelled, "April Fool!" But it was no joke. The lone gusher touched off a boom that turned Electra into an oil center. In 1958, pipeline runs totaled 6,000 barrels daily.

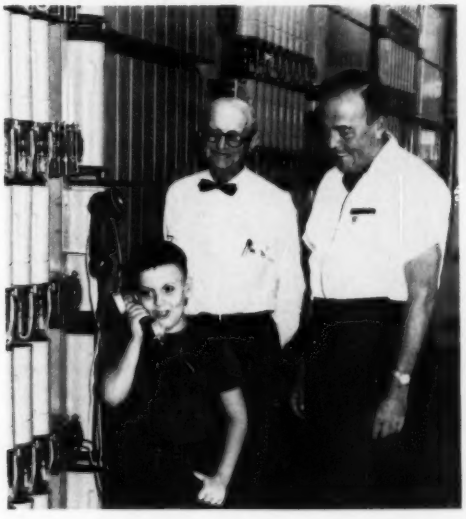
Electra is also an agricultural center because of its location within the fertile Red River Valley. Wheat farming and cattle raising are important sources of income.

Electra is served by Electra Telephone Company. Each day, Automatic Electric step-by-step switches work behind the scenes to give dependable, low-cost telephone service. Yes, Electra is another success story of Strowger Across the Nation.

MUNICIPAL SWIMMING POOL is one of the largest in this area. It is surrounded by a spacious park used for picnics, special events and sports. Other public facilities available to Electra's 6,500 population includes a country club, community center and a modern hospital.

ELECTRA TELEPHONE COMPANY serves the people of Electra from this modern building. D. M. Robb, shown leaving the building, is co-partner and manager of the exchange. Electra, with a total of 1,600 lines, was converted to dial service in 1953. Electra chose Strowger Automatic equipment to make its conversion.

NEW HOME SECTIONS (left) are springing up as a result of the building boom. Modern shopping districts are easily accessible to all residential areas. There are five modern schools and 18 churches representing all principal denominations.



A. L. ROBB (center), founder and co-partner, Electra Telephone Company, beams down on great grandson, Tony McCarty, in plant room of Electra exchange (right). Smiling approval over Tony's interest is L. C. Wiley, A. E. representative.

AUTOMATIC ELECTRIC

GENERAL SYSTEM

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

Parades often are an occasion for many telephone companies to demonstrate their participation in civic affairs. Here are photographs of the floats sponsored by two Independent telephone companies. LEFT PHOTO: The Northern Ohio Telephone Co.'s float featured the theme of "Still Growing" in a sesqui-centennial celebration at Norwalk. RIGHT PHOTO: This jet-age float won prizes for the Saskatchewan Government Telephones in the provincial exhibition parade at Regina and in the recent Saskatoon, Sask., exhibition parade.

White Is Vice President Of Rochester, N. Y., Company

H. Elwood White has been elected vice president and controller of the Rochester Telephone Corp. His election was announced by William A. Kern, company president.

A veteran of 37 years with the company, Mr. White joined the company's accounting department in 1934. He served successively as staff accountant, chief accountant and assistant to the

H. E. WHITE

controller before becoming controller and head of the accounting department in 1955. From 1922 to 1934 he held several positions in the plant engineering department and in the plant department.

A native of Athens, Pa., Mr. White attended the Wharton School of Business and Finance at the University of Pennsylvania and Syracuse University before receiving his bachelor of science degree at the University School of the University of Rochester.

He is a past president of the Genesee chapter of the Telephone Pioneers of America, past president of the Rochester chapter of the National Association of Accountants and a former national director of that organization.

S. Bell Magazine Receives Award for Legal Series

The American Bar Association, at its Miami, Fla. convention on Aug. 27 presented its gavel award to the *Southern Telephone News*, employe magazine of the Southern Bell Telephone & Telegraph Co., for outstanding contribution to the understanding of the American legal and judicial system. President Ben S. Gilmer received the award.

Specifically the company magazine was cited "for an outstanding series of articles serving to increase public understanding of the roles of laws and lawyers in American life."

The articles were prepared by members of Southern Bell's legal department in conjunction with the *News'* staff. The lead article was by General Counsel Jefferson Davis. C. S. Bolen is editor of the *News*.

President Ben S. Gilmer (right) of Southern Bell receives the American Bar Association's gavel award from Ross L. Malone, ABA president.

Communications Had Lowest Employe Injury Rate in '58

The National Safety Council reports that communications again led the industrial field with a low employe injury frequency rate in 1958 of .97. Electrical equipment was second again with 1.76, while aircraft manufacturing's 2.18 placed it third again.

For the third consecutive year, the Council said, communications was best in the severity column with an 85 rate. Service industries placed second with 124, electrical equipment third with 190.

Workers employed by member companies of the Council were hurt less often in 1958 than in 1957, but the injuries they suffered were slightly more severe.

That fact, along with the entire industrial injury rates for Council member companies, is contained in the 1959 edition of "Accident Facts," the Council's recently published statistical yearbook.

Of the 40 basic industry classifications, 28 had reduced injury frequency rates or no change, while 22 had lower injury severity rates.

The average injury frequency rate for employes of industries submitting company reports to the Council (based on the number of disabling injuries per million man-hours worked) was 6.17 in 1958, down 2 per cent from the pre-

BARTLETT

More than 12 years ago Bartlett successfully pioneered the use of the helicopter for shade tree spraying—an operation that was to lead the way, a few years later, to a new efficient method of control of woody plants along utility rights-of-way.

At first, difficult terrains presented unusual problems but gradually through research and experience, new equipment was developed and new herbicides and techniques perfected to overcome them. Today, Bartlett research in this important field is carried on continuously through college fellowships and at the Bartlett Research Laboratories.

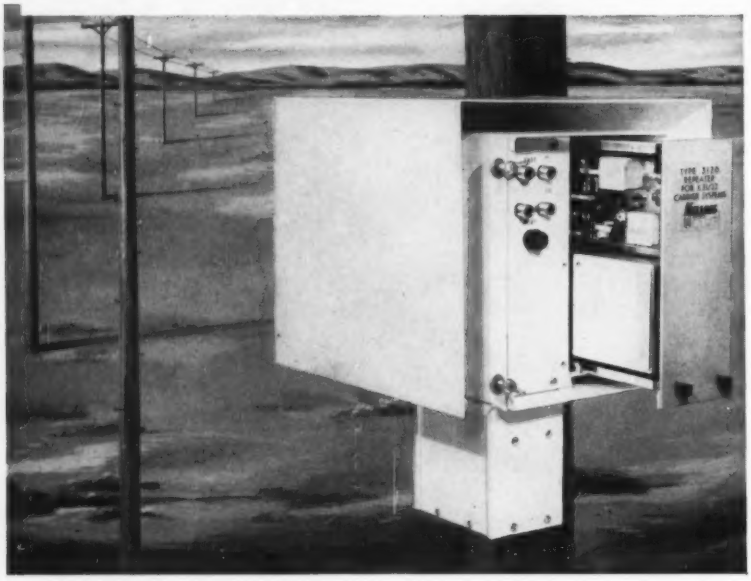
If your right-of-way clearance, line trimming, brush control or tree survey requirements present a problem, we invite you to share our years of experience. This service is now available from Maine to the Carolinas, and west to Indiana.

The Bartlett Way

BARTLETT TREE EXPERTS

Home Office, 2770 Summer Street, Stamford, Conn.
Research Laboratories and Experimental Grounds, Stamford, Conn.
Bartlett School of Tree Surgery, Stamford, Conn.

K-31
with the new
Kellogg Repeater
doubles
Carrier System Mileage!



The only system offering a Repeater

Check these advantages:

- ☑ Kellogg's exclusive new repeater *doubles* the mileage you get from your K-31 carrier system.
- ☑ Two repeaters *triple* your carrier mileage.
- ☑ And Kellogg repeaters are surprisingly low in cost!
- ☑ Kellogg Carrier offers more exclusive features than any other system on the market (see facing page).
- ☑ Kellogg's low price is complete, "no extras."

That's why you'll find Kellogg K-31 Rural Subscriber Carrier being installed by more and more independents across the country.

For more details on Kellogg Carrier see our ad on the facing page, then . . . call Kellogg for complete information.

KELLOGG
CHICAGO, ILLINOIS
ITT

Kellogg Switchboard and Supply Company
6650 South Cicero Avenue, Chicago 38, Ill.
Communications Division of International Telephone and Telegraph Corporation.

See pages 8-9 for list of Kellogg offices

vious year and at an all-time low. It was the fourth time in history the all-industry rate fell below 7.

The rate was 53 per cent lower than the average rate for the five pre-war years, 1935-39.

The average injury severity rate for industries reporting to the Council (based on the number of days lost from work per million man-hours worked) was 744 in 1958—up 1 per cent from 1957.

This rate was 52 per cent lower than the average rate during 1935-39.

Elect Kuchta President Of Pa. ITPA Chapter

M. E. Kuchta, of Clarks Summit, Pa., district manager of the Commonwealth Telephone Co., is the newly elected president of the Keystone State chapter, Independent Telephone Pioneer Association.

M. E. KUCHTA

Other officers of the Keystone Pioneers' Chapter include Bertha M. Eaby, Denver & Ephrata Telephone Co., Ephrata; and directors, William P. Strickenburg, Meadville Telephone Co.; Laverne E. Grandy, York Telephone & Telegraph Co.; and Paul C. Bransby, Columbia Telephone Co.

Mr. Kuchta has been associated with the Commonwealth Telephone Co. in an executive capacity since 1928.

Motor, Generator Maintenance Book Available From NEMA

"Protective Maintenance of Motors and Generators," an authoritative 63-page booklet has been produced by the renewal parts section of the National Electrical Manufacturers Association. It is intended primarily for the use of maintenance men in the electrical in-

dustry but it is also of interest to engineering students and others concerned with motor and generator problems.

The issue of the booklet was announced by John Drollinger, chairman of the section's information committee, and manager, renewal parts & repair division, Reliance Electric & Engineering Co., of Cleveland.

Included in the booklet is an appendix containing NEMA standards for classification of coils, insulating materials, replacement commutators and assembled segments, authorized engineering information on armature winding supplies, guides for maintaining continuous operation of motors and generators, preservation of renewal parts for electrical rotating apparatus, and proposed definitions of renewal parts.

These standards, NEMA says, will assist purchasers in obtaining the proper products to meet their particular requirements and will facilitate the work of those engaged in repair and maintenance operations.

Field tests of material in the booklet have established it as a ready reference for the handling of everyday maintenance problems common to electrical rotating machines.

Of special interest to maintenance men are four "planned" forms in the back of the booklet—two for motor, generator and control maintenance records, and two for motor service records.

Individual copies may be obtained without charge from NEMA headquarters, 155 East 44th St., New York 17, N. Y. Quantity copies may be purchased from NEMA at bulk rates.

Ghana To Operate Own External Communications

Operation of international wireless and cable services to Ghana will be taken over by the Ghana government after 1962 according to Krobo Edusei, minister of transport and communications.

At present, these services are operated by Cable & Wireless Ltd., whose operating license expires in 1962. The department of posts and telecommunications will assume these functions.

George Steele Recovering

George A. Steele, vice president and general manager of the United Telephone Co. of Indiana, Inc., Warsaw, Ind., is reported to be recuperating and progressing satisfactorily from a recent serious operation at Mayo Clinic. Mr. Steele at present is at St. Mary's Hospital, Rochester, Minn.

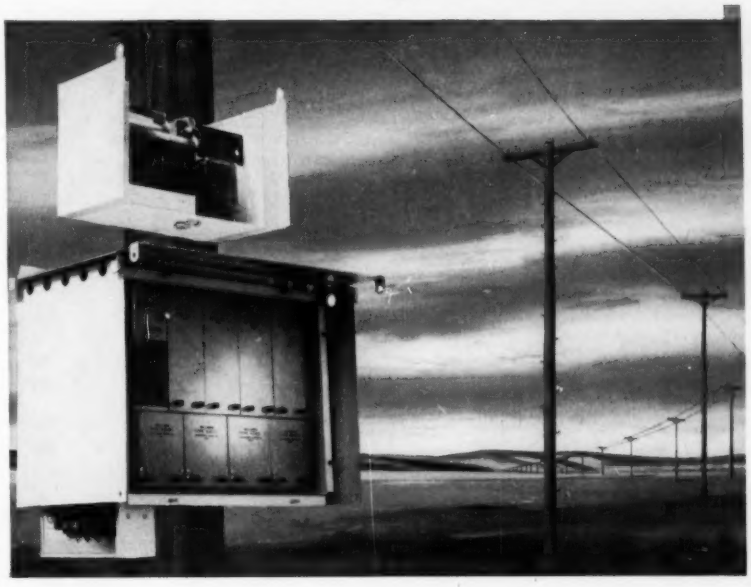
K-31

offers all these features

At Lower Cost

than any other

Carrier System!



☑ *Built-In Stand-By Power* as standard equipment! Sufficient to operate 4 channels for 12 hours if commercial power fails.

☑ *Built-In Compandors!* Reduce line noise and cross-talk on open wire line so that circuits meet transmission standards.

☑ *Automatic Regulation!* Maintains constant output level regardless of line loss variation due to changing weather conditions.

☑ *Completely Transistorized!* Including power supply! Guarantees steady toll quality performance.

Best of all, the low cost of the complete systems, "no extras," will enable you to prove it even on short distances.

Call Kellogg . . . and get full details on telephony's *most effective and economical* carrier system.

DON'T FORGET, only one relay is required for each terminal of Kellogg's K-32 Trunk Line Carrier.

KELLOGG Communications Division of IT&T
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Communications Division of International Telephone and Telegraph Corporation.

See pages 8-9 for list of Kellogg offices

SUPERIOR
INSIDE WIRING
CABLE

- **Multiple conductors paired and fully color-coded**
- **Lightweight**
- **Plastic-insulated**

Superior's Inside Wiring Cable is economical, efficient and easy to install.

Conductors are insulated with a tough vinyl compound . . . heat and water resistant and unaffected by humidity. Has high resistance to crushing and cold flow.

Easy to terminate . . . simply strip insulation.

Cross talk is minimized due to systematic varying lays of pairs.

Special vinyl jacket provides excellent protection for all inside wiring conditions.

For details, write

SUPERIOR CABLE

SUPERIOR CABLE CORPORATION
Hickory, North Carolina

3142

TRANSMISSION ASPECTS OF NATIONWIDE SWITCHING

Concluded from page 21

E repeater package, as shown in *Fig. 3*, was used. This ac operated unit is a very convenient method of quickly obtaining E repeater gain at any location.

(5) *Subscriber's Loop and Station Equipment.* This is always the first and last part of any connection. Use of the resistance design method is best, taking into account when necessary use of the improved type sets (usually on any loops over 10,000 feet in length.) Based on the resistance range of the central office involved, the choice of gauges depends only on the total cable resistance. All loops beyond 18,000 feet should be loaded. Bridged pairs should be kept to a minimum length to protect transmission and an absolute maximum would be approximately 6,000 feet. (This figure includes cable beyond the subscriber as well as any side taps.) Under no circumstances should bridged taps be made between load points. If loading and improved subscriber's equipment does not give a loop within transmission limits, negative impedance repeaters may be effectively used.

The tolerances on various components of the national switching system are necessarily small, and if each of the trunks was either over or under the correct level, high loss or extreme instability could result. There is no longer an operator to monitor the call as she turns the connection over to the subscriber. Maintenance checks must become much more frequent and be performed by people adequately trained to do the job. Use of many electronic devices such as carrier and repeaters makes the telephone equipment people of today and tomorrow require advanced techniques, equipment and knowledge. Trunks can no longer be installed and forgotten. For the moment, we must make frequent transmission measurements and tie-up valuable personnel.

The next step in this search for perfection is test equipment that will check all trunks automatically over the entire voice frequency band and reject circuits beyond critical transmission tolerances. Our research and development laboratory people tell us that this is not a far fetched pipe dream and that such techniques are not far from fruition.

The telephone industry today is in a period of very rapid growth and, at the same time, it must mechanize even more, as evidenced by the necessity for the nationwide switching plan. If all the links in this vast chain are designed and maintained within the proper tolerances, we can deliver good transmission to the customer. In the over-all picture this is the only product that justifies the existence of the telephone industry.

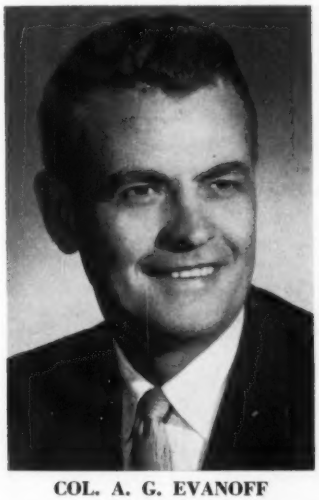
Fig. 3

General Company of Cal. Names Two PR Directors

The following personnel changes in General Telephone Co.'s public relations department have been announced, effective Aug. 1, according to Leroy E. Lattin, president of the California company.

S. A. JACOBUCCI

S. A. Jacobucci, former public relations supervisor, has been appointed assistant director of public relations. Colonel Alexander G. Evanoff, a retired officer of the United States Air Force, has also been appointed assistant director of public relations. Both Mr. Jacobucci and Colonel Evanoff, will report to G. A. Woods, director of public relations.

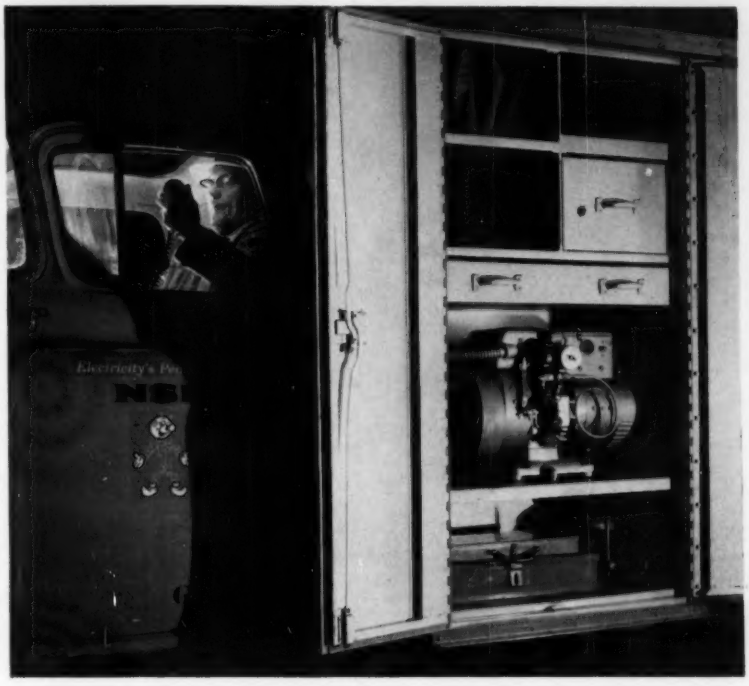


COL. A. G. EVANOFF

Colonel Evanoff was commander of Stead Air Force Base at Reno, Nev., prior to his retirement last May. He has also commanded bases in San Angelo, Tex. and in Korea.

A graduate of the University of Iowa in 1938, Evanoff majored in busi-

Onan NEWS REPORT



Built-in dual-purpose electric plant

delivers 2KW for tools and lights; keeps batteries fully charged, too!

Utility construction and maintenance trucks like this one, use two kinds of auxiliary electric power . . . and the Onan Electric Plant provides both. Workmen can plug in on the plant for 2,000 watts of 115-volt, 60-cycle A.C. to operate electric tools like drills, saws, soldering irons and floodlights. Or the plant will deliver 30 amperes of 12-volt D.C. to handle the battery drain of 2-way radio and battery-powered lights.

The Onan's D.C. output makes it unnecessary to run the truck engine to keep batteries charged, making savings in fuel and engine maintenance totaling hundreds of dollars per year per truck.

Leading body builders now install these dual-purpose Onan plants on new vehicles or you can mount them on vehicles now in service. Onan's Vacu-Flo cooling system permits installation within a closed compartment. Where no space is available in the truck body, the plant can be neatly installed over the cab within a handsome weatherproof steel housing.

Dual-purpose utility models are available with either 1,000 or 2,000 watts A.C. Powered by smooth-running single-cylinder Onan air-cooled gasoline engine.

ONAN INSTAPAC

Instantaneous standby power for microwave systems. No interruption of any kind of signal. No moving parts. Can be fitted to existing standby installations.

Call the Onan distributor listed in your phone book or write for specifications.

D. W. ONAN & SONS INC.

ELECTRIC PLANTS GENERATORS ENGINES ENGINE-COMPRESSORS

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Onan ELECTRIC PLANTS

NEW KLEIN
slitting tool
for all types of control cable

Patents 2398979
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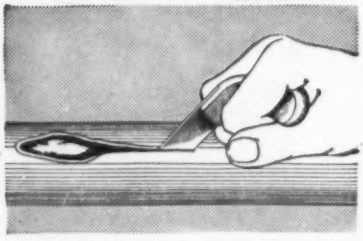
Cat. No. 1558



Here is a new tool developed by Klein, designed to slit insulation from flexible cords, PWC, telephone cable with vinyl or polyethylene jackets and bus drop.

Handle of cast aluminum, light in weight and with convenient grip; knife of tempered tool steel may be sharpened and is easily removed for replacement. This tool slits insulation from a few inches to as many feet as desired swiftly and simply. Does not damage conductors inside weatherproof sheath.

Write for bulletin giving complete information.

FREE POCKET TOOL GUIDE

A free copy of the new Klein Pocket Tool Guide will be sent on request without obligation.

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard
Electric Corp.
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Established 1857 Chicago, Ill., U.S.A.
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ness administration and later took courses in business management at George Washington University in Washington, D. C.

Mr. Jacobucci has been with General since 1947 and has held various service positions with the company. He was commercial supervisor in Covina before his appointment to his present position in public relations.

IMPACT OF TELEPHONE COMMUNICATION

Continued from page 30

chorage consists of fish, food and lumber products and railroad equipment. Anchorage has newspapers and broadcasting stations and nearly 100 million dollars in bank deposits.

Alaska is served by the Alaska Railroad Co., the White Pass and Yukon W P & Y, Yakutat and Southern Y & S. The airlines are: Alaska Coastal Airlines ACA, Alaska Airlines ASA, Cordova Airlines COR, Canadian Pacific Airlines CPA, Ellis Air Lines, EA, Northern Consolidated Airlines NC, Northwest Orient Airlines NWA, Pan American Airways PAA, Pacific Northern Airlines PNA, Reeve Aleutian Airways RAA, Wien Alaska Airlines WA. It might also be added that there are 50,000 passenger cars in Alaska.

The economic position of Alaska is further brightened by discovery of a stratum of oil on the Kenai Peninsula and an increase has been noted in production of natural resources during the past several years. The value of resources is 161.8 million dollars.

Water power development is now at 40,000 HP and this is merely a scratch on the surface of the potential of about 1½ million HP. Another measure for future development is education. School enrollment in thousands runs as follows: 25.1 on the elementary level, 4.8 on the secondary, and 2.5 in institutions of higher learning. As to wage earners, the figure is probably around 175,000.

The great visionary, a sort of second Jules Verne, a man whose statements have been proved correct, the late Gen. William Mitchell, said this of Alaska (here summarized):

Alaska is the most central place in the world for aircraft and this applies to Asia, Europe, and North America. Alaska is the most strategic place in the world, and he who controls Alaska can control the world. (While General Mitchell did not say it, here would be a good place to add that Australia is closer to Alaska than any other portion of North America.)

The airline service, now routine in Alaska, undoubtedly far surpasses anything General Mitchell dreamed possible but, even so, it is as nothing compared to what lies ahead. Alaska is destined to be a commercial entrepot, an airline center, a magnet for tourists and many other things that go along with the most renowned location on the face of the earth. We are glad to have Alaska and we hope they are glad to have us.

And, as the curtain rises again on the stupendous drama that surrounds Alaska, we know that every detail will be worked out to everyone's complete satisfaction, and we are sure of this because the means of communication are there.

Hawaii

The estimated population for 1959 is 610,000 and the retail sales are currently believed to be in excess of 600 million dollars. The size of the average farm is 423 acres and the value of land and buildings runs at approximately $35,000 per farm. There are 169 thousand motor vehicles.

The principal business center is Honolulu which accounts for about half of the total population and this is a good clue to the extent of urbanization.

Hawaii is served by the following railroads: Kahului Railroad KAH, Lihue Plantation Railroad LP, United States Government USG. Airlines are: BOAC (British Overseas Airways Corp.), CPA (Canadian Pacific Airlines), HAL (Hawaiian Airlines), JAL (Japan Airlines), NWA (Northwest Orient Airlines), PAA (Pan American World Airways System), QEA (Qantas Empire Airways), TOAL (Transocean Air Lines), TPA (ALOHA Transpacific Alaska Airline), UAL (United Air Line).

As to wage earners, there are probably around 325,000 at the moment, and personal income in millions of dollars is now in the neighborhood of 1,000, which has fluctuated as follows: in 1939 it was 218; 1940, 246; 1941, 341; 1942, 612; 1943, 778; 1944, 1,028; 1946, 719; 1947, 721; 1948, 725; 1949, 685; 1950, 689; 1951, 796; 1952, 864; 1953, 889; 1954, 886; 1955, 946.

The per capita personal income has also varied as noted: In 1939 it was 525 dollars; 1940, 577; 1941, 749; 1942, 1,087; 1943, 1,186; 1944, 1,239; 1945, 1,328; 1946, 1,312; 1947, 1,384; 1948, 1,411; 1949, 1,354; 1950, 1,403; 1951, 1,586; 1952, 1,721; 1953, 1,740; 1954, 1,704; 1955, 1,720. The population in thousands for the same period has been: 415, 426, 455, 463, 656, 830, 760,

548, 521, 514, 506, 491, 502, 502, 511, 520, 550.

Since Hawaii will more and more serve as the gateway between the Orient and the Occident, great trade marts will undoubtedly grow steadily and successfully, particularly in Honolulu. The best guaranty for peace and prosperity is trade which must flow with a minimum amount of restrictions and prohibitions. And there need be no worry that one segment of the world will reduce the so-called standard of living of another segment.

No one has any ambition to have less and less, and no one has the slightest desire for a lower level of life measured in terms of material comforts. This means that untold millions of people will demand more and more of the comforts of the world, and these demands will set into motion a type of world economy that will at long last satisfy demands through orderly creative processes instead of through the multiple hells of ghoulish wars.

AMPLITUDE MODULATION

Continued from page 27

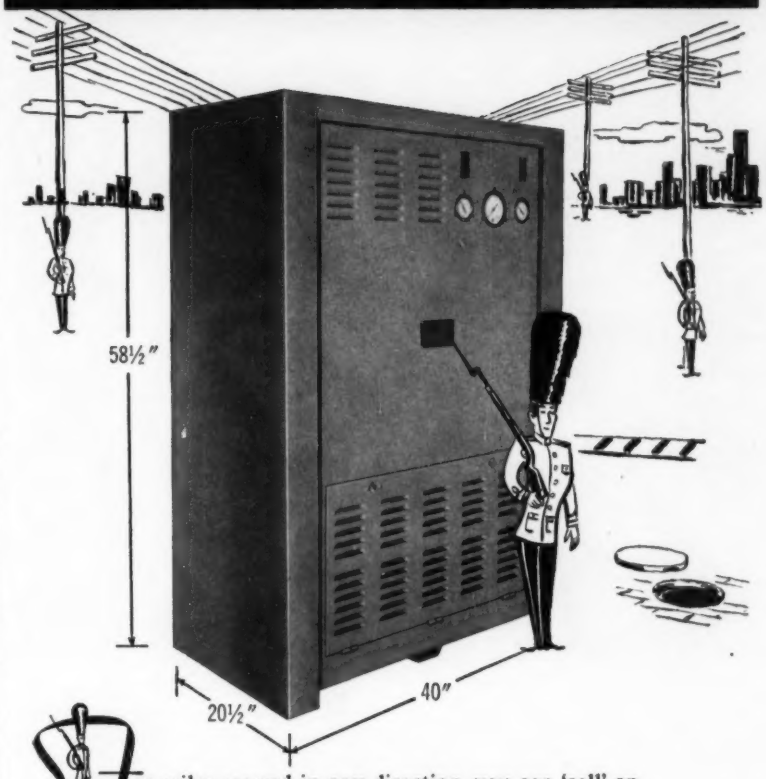
In most carrier-telephone systems the component of carrier frequency is not transmitted. At the receiving end a component of the same frequency as the suppressed carrier must be introduced for demodulation. The circuits used are those which have been considered for modulation, and the theory of operation is the same. Of course, the output wave shapes will be different, because a component of sideband frequency, instead of a voice modulating signal, will be introduced at E_v.

For *Fig. 2* (in preceding article), if a sideband frequency signal of 3,000 cycles is introduced at E_v, and if the carrier frequency is 3,500 cycles, the output into load resistor R_L will consist of three major components—the carrier wave of 3,500 cycles, a "sum" frequency of 3,500 + 3,000 = 6,500 cycles, and a "difference" frequency of 3,500-3,000 = 500 cycles; this latter is the original modulating voice-frequency component.

For *Fig. 4*, if a side signal of 3,000 cycles is introduced at E_v, and if the carrier frequency is 3,500 cycles, the output wave will consist of the following three major components—3,000 cycles, 6,500 cycles, and the voice-frequency component of 500 cycles. For *Fig. 6*, the output will contain only the two major components of 6,500 and 500 cycles.

In practice, the received lower sideband might be a signal within the band 19,800 to 16,000 cycles as explained in

PUREGAS
ON GUARD...
...like a sentry
at every post



For miles around in any direction, you can 'call' on PUREGAS. Dry air cable pressurizing by PUREGAS helps guard against subscriber service interruption and rising maintenance costs. PUREGAS installations protect capital investments while guarding profits. The PUREGAS Model 5000 Air Dryer (illustrated) is a self-contained unit, taking up less than 6 square feet of floor space and weighing only 950 pounds (approx.), yet it delivers up to 7000 cubic feet of dry air in a day.

Above or below ground, remember dry conductors serve better and dry cables last longer. Service goes up and maintenance costs go down when PUREGAS goes to work guarding all along the line.

New technical bulletin ready on "Why cables should be pressurized"—ask for your copy today.

PEC

PUREGAS...*pioneers in DRY AIR pressurization.*

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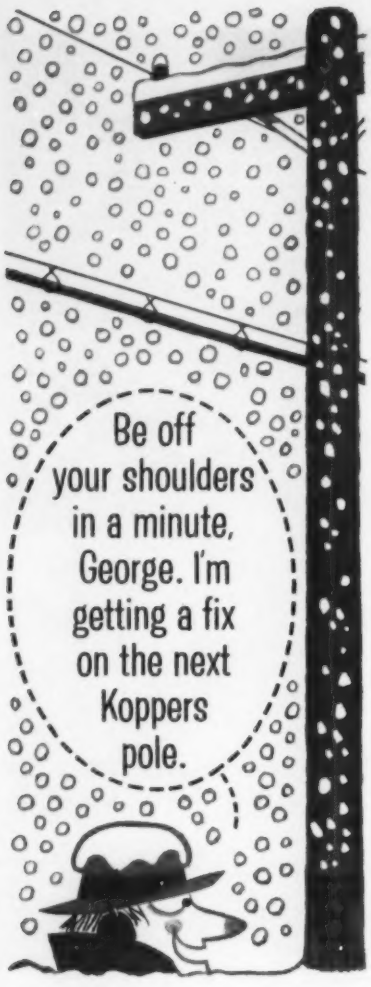

C-32

CALL ON
KOPPERS
for rail or truck deliveries of POLES and CROSSARMS from plants and delivery yards
OFFICES IN PRINCIPAL CITIES
KOPPERS
WOOD PRESERVING DIVISION
KOPPERS COMPANY, INC.
Pittsburgh 19, Pennsylvania

the preceding article. If this were demodulated with a 20,000 carrier, the resulting "difference" frequencies would give the original modulating speech wave of 200 to 4,000 cycles.

(The End)

NORTH DAKOTA DIAL MOBILE SERVICE

Concluded from page 23

service station in Parshall primarily to take care of the telephone system. Operated by Herb Stall, an independent business man, this local station performs the maintenance work under subcontract. Backing up Mr. Stall is the Motorola district service engineer who assisted during the system installation. Thus far, Mr. Stall has reported no significant maintenance difficulties.

Subscribers are having no difficulty operating the mobile equipment, said Mr. Ahlgren. Using the pushbutton dial is easier than operating the conventional dial in a vehicle, he says. Training the subscribers is simply a matter of showing them how to punch out desired numbers and teaching them the knack of "pushing to talk" and "releasing to listen."

There have been no battery difficulties with any of the subscriber's vehicles thus far, Mr. Ahlgren reports, although some leave the radio-telephones turned on while out of the car. The telephones can be hooked to the vehicle horn to signal an incoming call.

Only one subscriber has been lost, says Mr. Ahlgren. This was a veterinarian who changed automobiles and did not wish to pay the fee to have the unit reinstalled.

Besides the service and revenue provided by automatic mobile dial, Mr. Ahlgren feels the very modernness of the equipment has done much to increase Reservation Mutual's prestige in its operating area. North Dakota newspapers, magazines, radio stations and even the United Press International Wire Service have carried articles on the system, highlighting the progress it has brought to the area.

All in all, Reservation Mutual, according to Mr. Ahlgren, is finding its mobile dial systems most beneficial as an investment and quite compatible to its unattended exchange mode of operation.

Citizens Utilities Awards 6th Briggs Scholarship

Jeannette Frazee of Susanville, Cal. is the recipient of the sixth Citizens Utilities Co.—Joseph C. Briggs Memorial Scholarship award for $500.

The presentation was made by D. H. Steele, general manager of Citizens' California telephone operations. Jeannette's father, Lewis W. Frazee, is equipment supervisor of the company's operations at Susanville.

The award is the sixth in a program established by the company as part of a project for financial assistance to high school graduates desiring to pursue higher education.

The scholarship award culminates a nationwide competition among children, grandchildren, brothers and sisters of employes of Citizens Utilities Co. Citizens operates telephone, electric, gas, and water properties serving more than 250 communities in eight states: Ari-

Jeannette Frazee of Susanville, Cal. is shown as she receives the $500 Citizens Utilities Co.-Joseph C. Briggs Memorial Scholarship from D. H. Steele, the company's general manager for California telephone operations.

zona, California, Colorado, Idaho, Illinois, Maine, Pennsylvania and Vermont.

The scholarship was established as a memorial to the former administrative vice president who met an untimely death in an automobile accident in 1951. Each year a $500 award is made. It is composed of voluntary contributions from more than 25 employes associated with the company and a contribution by the company.

The award is made on the basis of scholastic record, recommendations of school authorities and community leaders, and a brief competitive examination given all applicants.

In announcing the award, Richard L. Rosenthal, president of the Citizens company stated: "This program has been designed to assist those children of our Citizens Utilities' family whose secondary school records demonstrate that they deserve and can utilize the benefits of higher education. . . . The award is part of our effort to make a continuing contribution to the American tradition: Opportunity for ability and reward for endeavor—regardless of origin or creed."

Jeannette Frazee, the scholarship recipient, intends to enter the College of the Pacific at Stockton, Cal. as a language major.

Bell Labs Science Program Produces Five A-V Aids

Six new audio-visual (A-V) aids to science education have been produced by the Bell Telephone Laboratories, and they are now being made available without charge for use in college science and engineering courses.

They were prepared by Bell Laboratories scientists and engineers — men recognized in their fields—as their contribution to the furthering of science education.

The films are designed either to fit within the content of a specific college course, or to provide a broad view of a particular technological field that cuts across several different college courses.

The following titles have been released:

(1) *CRYSTALS—AN INTRODUCTION*—motion picture: 16mm; color; sound; 25 minutes.

This classroom film is primarily designed to provide an introduction to crystallography for students of electrical engineering. It is also appropriate for some courses in physics, chemistry and metallurgy.

The film introduces the subject of crystals by demonstrating the orderly arrangement of atoms in the crystalline state and the relation of this arrangement to the physical properties of the substances.

It was prepared in close cooperation

In addition to their regular stock and custom transformers for the electronic industry, ADC has long been a dependable source of transformers and filters to the telephone and telegraph industry. When Western Electric announced they would no longer supply these components to manufacturers, ADC put their 24 years of experience to use designing and tooling a series of "coils" which are electrically and physically interchangeable with similar components made by The Western Electric Company. Many of these are in stock. If you use such components, we suggest that you write for more information. We believe you'll be pleased with both the price and delivery.

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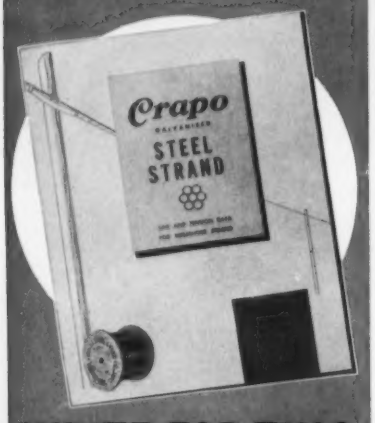
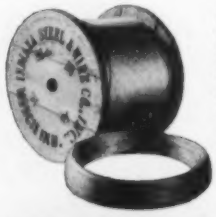


WRITE FOR THIS NEW MANUAL!

Those who design, build and maintain aerial telephone cable lines will find the technical information in this manual both pertinent and useful.

The sag and tension data cover three sizes of "Utilities Grade" strand when used as messenger to support plastic-sheath or lead-sheath cable. These data will be helpful in determining the size of strand to be used for a particular weight of cable and span length, and in answering other questions relating to design problems.

This Manual will be mailed without obligation to all interested telephone men. Ask for Manual No. MS-58.



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with Dr. Elizabeth A. Wood, a past president of the American Crystallographic Association.

(2) *BRATTAIN ON SEMICONDUCTOR PHYSICS*—motion picture: 16mm; black and white; sound; 30 minutes.

Walter H. Brattain, Nobel Laureate in physics, gives an introductory college-level lecture on the physics of semiconductors. He demonstrates thermal emf, photo emf, and rectification; and introduces a simple mathematical model which describes the observed properties of semiconductors.

The history, impact and new semiconductor phenomena are also briefly treated.

Dr. Brattain shared the Nobel Prize in 1956 for his co-invention of the transistor.

(3) *SUBMARINE CABLE SYSTEM DEVELOPMENT*—motion picture: 16mm; sound; color; 18 minutes.

An informational film describing the work of mechanical engineers in designing and developing underwater communication systems.

The film was prepared under the technical supervision of Dr. N. H. Upthegrove.

(4) *ZONE MELTING*—filmstrip: color; 133 frames; narration on two 33⅓ rpm records with universal groove; 45 minutes.

Describes the new method of ultra-purifying solids and controlling the distribution of impurities in solids. Prepared by William G. Pfann, the inventor of zone melting. There are four parts, which can be shown separately or consecutively:

I. Introduction to Zone Melting, Purification by Crystallization

II. Zone Refining Theory

III. Zone Refining Techniques, Floating Zone Refining, Continuous Zone Refining

IV. Zone Leveling, Temperature Gradient Zone Melting, Zone Remelting, Solar Zone Refining, Zone Melting Applications

(5) *THE FORMATION OF FERROMAGNETIC DOMAINS*—filmstrip: color, 132 frames, narration on two 33⅓ rpm records with universal groove; 45 minutes.

Discusses the physical principles of domain formation with particular emphasis on the energies involved in the process. Techniques used in observing domains are described, and domain patterns which conform to theory are shown.

The filmstrip was prepared under the supervision of H. J. Williams, who has made contributions to the field of ferromagnetic domains over many years.

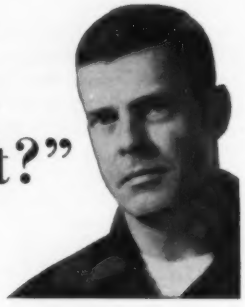
(6) *THE SCIENCE OF SOUND*—record album: two 33⅓ rpm microgroove recordings; 90 minutes.

Demonstrates 19 different acoustic phenomena with narration written by Bell Laboratories scientists.

The three motion pictures, two filmstrips and the record album are part of the comprehensive Aid to Science Education Program which Bell Laboratories initiated several years ago.

These visual aids were produced following a survey of engineering col-

"Troubled by Drift?"



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leges, conducted by Bell Laboratories, to determine the need for advanced-level science and engineering films.

The response of educators was enthusiastic. With their advice, a science film production unit was formed at Bell Laboratories for the primary purpose of making films that college instructors could use to complement their regular lectures in science and engineering.

In all cases, a Bell Laboratories scientist who is a well-known authority in his scientific area, acts as consultant during the production of the films. The films are also screened by other scientific experts to double check technical accuracy before release. For each production, educators in appropriate fields are consulted to ensure proper educational values.

The science education audio-visual aids contain no advertising material, and are loaned without charge to professional groups as well as to educational institutions through local Bell Telephone Co. offices.

IN THE NATION'S CAPITAL

Continued from page 18

for union bosses (no reflection on utility unions here, as they have been quite clean on this sort of thing) who steal or misuse union funds, or conspire with criminal types or set up phony trusteeships, and other examples of arrogance and abuse disclosed in the Senate investigation. In other words, the new law will not interfere with either the goal or the growth or the freedom of any legitimate union.

Some leaders will probably continue to squawk just as the bankers and the public utility bosses squawked when they got their reform medicine in the Public Utility Holding Company Act 24 years ago. After all, nobody likes to take medicine. But it really does some good. Even the union leaders may finally come around to the point of admitting over-all beneficial results.

Other Bills in Congress

Once more the effort to remove the exemption from the Fair Labor Standards Act of telephone operators' wages at small exchanges has been fruitless because the House did not get around to taking final action on the bill. The measure has been stalled in the House Labor Committee, but will probably get favorable action next year. At least for the balance of 1959 the telephone operators' exemption remains intact. The same can be said of other provisions of the bill to increase the minimum wage from the present $1.00 an hour to $1.25 for those companies subject to the law.

Despite the early clamor for reform

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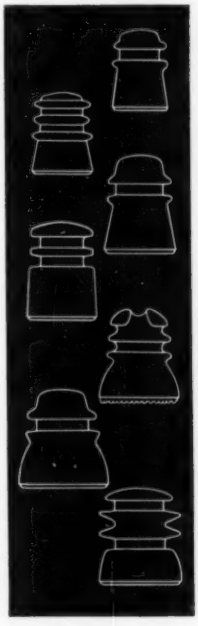

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legislation to shake up the Federal Communications Commission and other federal regulatory commissions, nothing happened at the first session. This was due to the wise and cautious leadership of Rep. Oren Harris (D., Ark.), chairman of the Interstate and Foreign Commerce Committee. He is also chairman of the House Sub-committee on Legislative Oversight, which got off to such an erratic start last year in connection with sensational disclosures of a few irregularities in the field of television licensing.

It is granted that some correction is in order. There was danger that hasty action might seriously impair effectiveness of commission regulation through unnecessary restrictions. Several bills on the subject are pending in Congress. But at the recent American Bar Association convention, Representative Harris assured the members of the Section of Public Utility Law that this type of legislation should be given careful consideration which precluded any action at this time.

The House and the Senate did pass the so-called "equal time" bill to permit broadcasters to have political figures on news, interview, and documentary programs without granting "equal time" to their opponents. This minor amendment to the Federal Communications Act was made necessary when the Federal Communications Commission refused to take the responsibility for limiting so-called "equal time" to major party candidates or programs which were ostensibly political instead of being only incidentally so as part of news programs.

Triumph of the Cummerbund

Most Americans as well as the English were highly gratified by the evidence of allied unity shown in the world-wide television broadcast on Sept. 1 of that Eisenhower-Macmillan informal talk in London. British-American friendship is fine and all that. But the whole thing was very disappointing to this writer. Frankly, he felt Ike had let him down, after nearly eight years of loyalty to his old double-breasted tuxedo.

If you noticed it, Ike had on one of those cummerbunds! This cummerbund thing, as you probably well know, is a sort of a pot-holder—probably invented by a harrassed undertaker trying to lay out a difficult corpse. It is supposed to drape around the abdominal bulge in such a way as to minimize the tropical zone without emphasizing the equator. Macmillan had on one, too. He wore his so high, it looked like a bib or some sort of clerical collar. What a chance there was, at that Ike-Macmillan soiree, within the

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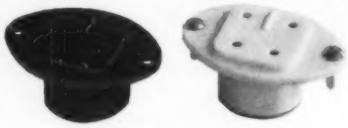

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very shadow of the men's fashion bastion of Bond Street, for Ike to strike a blow for liberty! All he had to do was drag out his faithful old double-breasted tux, which has seen him through two major election campaigns and many a grease spot on the fried chicken luncheon circuit.

Don't think the clothing lobby doesn't do its stuff here in Washington, along with all the other lobbies. For the past three years a fellow from New York has been coming to the District of Columbia to look over our congressmen in the Capitol, and pick out what he calls the "10 worst dressed." Newspapers naturally eat this up. And the congressmen themselves love it (oddly enough) because it is supposed to be good politics to be a sloppy dresser. This is especially true for a millionaire, such as Senator Capehart (R., Ind.), who was picked, this year, as No. 1 in the Slob Parade. Sen. Paul Douglas (D., Ill.), was the runner-up for the No. 2 spot.

Traditionally, the American voters are supposed to approve of the homespun wrinkled types, in the Abraham Lincoln manner, and distrust the Fancy Dan varieties. But to hear this clothes fellow talk, the worst thing a congressman could possibly do is to put on a double-breasted suit, especially evening dress. Running off with his best friend's wife or stealing from his own campaign fund would be minor peccadillos in comparison.

Your correspondent feels that he has a vested interest (perhaps a more proper phrase would be "nonvested interest") in a double-breasted tuxedo purchased way back in 1950 during a grave emergency at an out-of-town convention when he was suddenly called upon to pinch hit as a speaker for a fellow Washingtonian who had succumbed to a tainted Martini, or maybe a flock of them. Anyhow, it seems that right after that—the very next day, maybe—the tycoons of the haberdashery trust must have gone into a huddle in a smoke-filled room and decided unanimously "The double-breasted coat must go!" Well, your editor wouldn't buy it. After all, he had put out hard-earned dough to get that satin-finished gravy boat and he wasn't going to be cut off. But that's where he was wrong. Friends began to point and snicker. The better half threatened open rebellion. It was rugged.

Then a glorious thing happened right here in Washington at the Inaugural Ball in 1953. What does good old Ike do but show up in a handsome double-breasted! What's more, he's worn it quite often ever since, while the haber-

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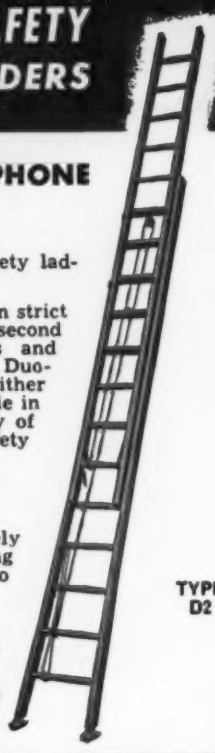

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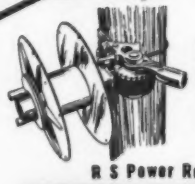

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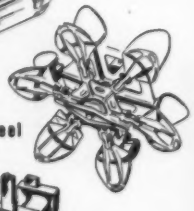

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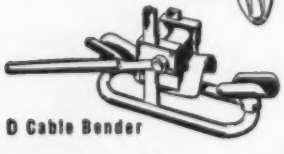

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dashers wrung their hands and tore their hair.

Oh, well, all good things must come to an end. Perhaps Ike felt it his duty to conform to British taste in men's fashions for the sake of allied unity. As for allied unity, this writer will believe in it when he sees General Charles De Gaulle in an Hawaiian sports shirt. That will be the day!

Book Review

"MASERS," by J. R. Singer; $6.50.

A unified description of microwave amplifiers operating on the induced emission principle appears in this new book.

Masers are still large and expensive, the author notes, but the vast potentials of this comparatively new device —in radar and other forms of amplification, for example—are increasingly evident.

Dr. Singer undertakes to summarize the years of research that culminated in the maser's discovery, to provide a survey of the device's operation at present, and to indicate the steps being taken to streamline its design and application.

The author approaches his subject from both the classical and quantum mechanical points of view. In the early part of his book, he describes the ammonia maser and gives a theoretical discussion of a magnetic beam system.

A short section on an optically pumped frequency standard is followed by a discussion of electron paramagnetic resonance. Since two-level masers show promise in obtaining a coherent source of submillimeter waves, Dr. Singer devotes a chapter to this exposition. Three-level cavity masers are covered from a historical point of view, with numerical illustrations provided to give a good idea of their feasibility.

The final chapter deals with the theory and experimental results of the traveling wave maser. Information on two important maser design techniques, the isofrequency plotting and the multiple pumping methods, is included among the appendices.

Dr. Singer, associate professor of electrical engineering at the University of California in Berkeley, was formerly the chief staff physicist of National Scientific Laboratories, Inc., in Washington, D. C. He has also been in the physics research division of the Naval Ordnance Laboratory.

This book may be purchased from TELEPHONY.

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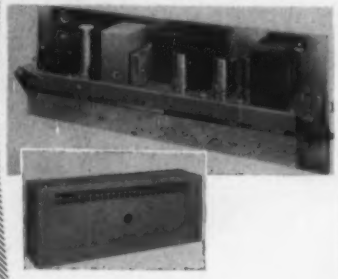

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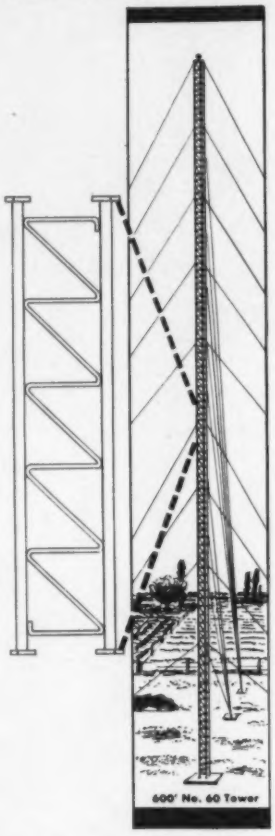
News on New Products

HEAVY-DUTY TOWER—A heavy-duty communication tower known as



the No. 60 tower is now being manufactured by Rohn Mfg. Co.

This Rohn tower utilizes the No. 9 section of the Rohn "self-supporting" tower and is said to provide outstanding rigidity and strength in heights up to 630 feet when properly guyed. Its strength lends the No. 60 tower to a wide range of communication uses including the mounting of antennas for microwave, radio communications, radio telephone, military needs, TV reception, and amateur uses. It is particularly desirable where extreme windloading and height requirements must be met, Rohn says.

All tower sections, according to the company, are completely hot-dipped galvanized after fabrication to permanently protect all points of welding and construction against corrosion. Ease of shipping and installation are facilitated by the uniform 10 foot length. Each section is a 26¼ inch equilateral triangle in size with ⅝ inch solid steel rod zigzag cross-bracing attached to 2 inch-11 gauge tubing for legs. Request NP1178.

•

INDUSTRIAL SWIVEL-CLAMP MAGNIFIER—Announced by the Edmund Scientific Co. is a new, 4-inch, +5 diopter magnifier, equipped with swivel clamp. It is designed for use in industry—on work and inspection benches, for draftsmen's lamps, machine tools, on assembly lines and wherever precision instruments require precise setting, or where speed-gauge readings or parts comparisons must be made.

A handy screw clamp with 5/16 inch

TELEPHONY PUBLISHING CORP.
608 S. Dearborn St.
Chicago 5, Ill.

Please have the manufacturer send me without obligation the literature indicated by the following numbers:

NP1178_____; NP1179_____; NP1180_____; NP1181_____;
NP1182_____; NP1183_____; NP1184_____; NP1185_____;
NP1186_____; NP1187_____; NP1188_____; NP1189_____.

Name..... Title.....

Company.....

Street.....

Town and State.....

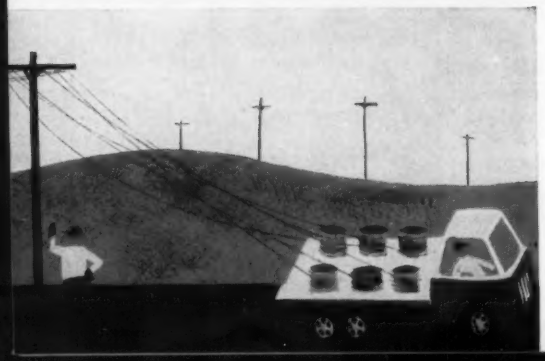
9/12/59

When you specify *standard* **COPPERPLY®** (30% or 40% conductivity copper coated steel wire) for telephone wire or for rural distribution wire, you get the unique National-Standard advantages of precise concentricity and optimum uniformity with maximum corrosion protection.

But . . . if wire exposure doesn't call for the corrosion protection of 6 to 8 mils of copper—which is often true in heavier wire sizes—then you can get additional savings with *tailored* **COPPERPLY.** The enlarged cross sections illustrated at the left show examples of tailored coatings that can be produced by National-Standard's exclusive electroplating process to meet specific requirements. With *tailored* **COPPERPLY** you save even more because *you don't pay for excess copper.*

COPPERPLY has proved itself with contractors and telephone companies in over 50 installations across the country because it resists kinks, strings easily, provides long service life and accommodates future carrier circuits without additional line work.

COPPERPLY is available in continuous non-welded lengths up to 1000 pounds (high strength and extra-high strength grades) in all standard sizes from No. 3 to No. 18 AWG. For catalog information write to National-Standard Company, Niles, Michigan.



COPPERPLY
NATIONAL-STANDARD

DIVISIONS: **NATIONAL-STANDARD**, Niles, Mich.; tire wire, stainless, music spring and plated wires • **WORCESTER WIRE WORKS** Worcester, Mass.; high and low carbon specialty wires • **WAGNER LITHO MACHINERY**, Secaucus, N. J.; metal decorating equipment • **ATHENIA STEEL**, Clifton, N. J.; flat, high-carbon spring steels • **REYNOLDS WIRE**, Dixon, Ill.; industrial wire cloth • **CROSS PERFORATED METALS**, Carbondale, Pa.; decorative, commercial, and industrial perforated metals.

One Call For All!

Straight Neoprene-Jacketed Instrument Cords with twisted or parallel inners.

Nylon Operators' Cords and Switchboard Cords, with or without Plugs

Neoprene Handset Cords with Moulded Strain Reliefs

Spiraflex Retractile Cords

It's a fact! . . . COMMERCIAL *is* headquarters for one of the most complete and diversified lines of cords available today . . . guaranteeing highest quality and prompt service to meet your every requirement. Remember this whenever you need good cords in a hurry.

Write for Catalog, Samples and Prices.

P.S. Commercial Instrument Cords are now available in color!

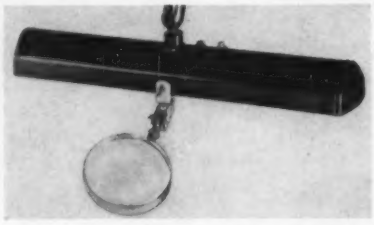
COMMERCIAL CORD COMPANY, INC.

CLIFTON SPRINGS, N. Y.

Phone: HOward 2-2311

QUALITY CORDS FOR ALL MAKES AND TYPES OF TELEPHONE INSTRUMENTS

clearance attaches to the electric light housing or any other fixture and the two-ball swivel permits easy adjustment to any position with one hand, the company says. Its large 4-inch diameter



allows use of both eyes so that a 3-dimensional effect is obtained.

The precision ground lens has an 8 inch focal length.

The magnifier is described as sturdy, with all-metal mount and all-position, free swivel. Request NP1179.

•

SWITCH TESTING DEVICE—A new device capable of testing a wide variety of switches has been developed by Automatic Electric Co.

The portable, self-contained unit—designated the Type 26 portable switch tester—is housed in a metal cabinet 1 foot, 2 inches wide, 6¼ inches high and 1 foot deep. The tester operates on an office battery supply of 48 volts at any convenient outlet.

Automatic Electric states the tester's capabilities include tests for loop or leak pulsing; monitoring; stepping; busy; ring; answer; and many other operations.

A remote control set with cord provides switch testing facilities from a ladder. The Type 26 switch tester is arranged for use with a varying machine—with or without the remote control unit. Request NP1180.

•

MULTI-LINE TELEPHONE — Automatic Electric also announces that it will begin producing in October a self-contained, three-line telephone with a hold feature on each line.

The company states the new instrument, designated the Type 87 key telephone, offers advantages of economy to small business users by providing multiple-line pick-up and hold features without requiring separate control relays for each feature. Mechanical switching, ringer, holding bridges, and visual signaling equipment are all contained within the telephone's housing.

Developed by General Telephone Laboratories, the key telephone instru-

Stahl

SERVES THE TELEPHONE INDUSTRY!

Stahl Side Boxes — convert pick-ups into efficient Service Trucks.

Stahl TMI-76 — Lowest-cost Telephone Body in the Industry!

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MAIL THIS COUPON TODAY FOR COMPLETE INFORMATION & PRICES!

Check product in which you are particularly interested.

Stahl Metal Products, Inc.

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ment is designed for use on PAX, PABX or central office lines.

Pick-up and hold features on three lines are provided by means of three pairs of translucent, locking push-buttons, arranged in a row beneath the dial. These buttons are mechanically linked so that operation of either one of a pair will restore the associated button.

A straight-line ringer within the instrument housing provides audible signaling for any one of the three lines. Neon bulbs beneath the pick-up buttons are lighted by the ringing current to indicate on which of the three lines a call is available.

A seventh pushbutton allows the user to signal a secretary, an extension telephone, or in certain PABX's to transfer an incoming trunk call to another station.

The Type 87 telephone can be equipped to assure complete privacy for the user, Automatic Electric states. As an optional feature, extensions can be excluded from one line by means of two pushbuttons located near the handset. Pushing one of these cuts off all extensions; pushing the other restores the extensions. To guard against leaving extensions off the line after the call has been completed, extensions are automatically restored when the handset is replaced on the cradle.

The new Type 87 telephone will be available in black and in the company's full range of 10 colors. Request NP-1181.

•

OUTDOOR JACK — Announced recently for telephone operating companies by Suttle Equipment Corp. is the S. E. 16151 outdoor weatherproof jack, a heavy-duty-aluminum, rubber-gasketed housing which comes equipped with a four-hole spring-tensioned jack.

The S. E. 16151 outdoor jack can be mounted, for example, at the patio, back or front yard, garage, or any outdoor location at the subscriber's home or place of business. A telephone instrument equipped with the S. E. 283B

ALPHADUCT UNDERGROUND "B" SERVICE WIRE

ELIMINATES UNSIGHTLY OVERHEAD DROPS

PROVIDES EXTRA PAIR FOR SECOND PHONE

...and no other underground service wire can compare with Alphaduct for sheer ruggedness and trouble free service under unfavorable operating conditions. Alphaduct is engineered to withstand moisture, heat, abrasion, deformation and you get these PLUS FEATURES:

HIGH DIELECTRIC STRENGTH

HEAT STABILIZED POLYETHYLENE INSULATION

MINIMIZED CROSSTALK through control of side to side Capacitance Unbalance

ALUMINUM TAPED for electrical shielding against lightning and interference

CONDUCTORS—annealed copper covered steel for strength

AND IT'S DATED—simplifies your record keeping ...proves Alphaduct's durability

When you buy Alphaduct Underground "B" Service Wire, or any one of Alphaduct's different types of telephone wire—you buy the know-how of the recognized leader in the manufacture of insulated wires for the Independent Telephone Industry.

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SMALL—COMPACT—RUGGED
EASY MANEUVERABILITY

TRENCHING IS MORE PROFITABLE WITH THE BUS BROWN TRENCHER

MODEL 346 OFFERS

- More Economy
- Maximum Efficiency at Minimum Cost
- One Man Operation Eliminates High Labor Costs
- More Speed
- Digging Speed and Maneuverability Leads to Faster Job Completion
- Simplicity—Compact and Simple Design Eliminates High and Extensive Maintenance Costs
- Designed For Many Digging Jobs —
  - Water Lines
  - Gas Lines
  - Underground Electrical Wire
  - Lawn Irrigation
  - Underground Telephone Cable
  - Signal Cable
  - Laying Out Limits For Excavations

SPECIFICATIONS

1. Power — Model AENL Wisconsin engine.
2. Shipping Weight — 750 lbs.
3. Frame — Rigidly Welded ¼" steel plate.
4. Tires — 4x8 Pneumatic, traction type.
5. Digging Chain — Tough Roller Chain with easily detachable Cutters.
6. Bearings — Roller Bearings with zerk fittings. Ball Bearings, permanently sealed.
7. Trenching Width and Depth —
   3 inches wide up to 5½ feet deep.
   4 inches wide up to 3½ feet deep.
   6 inches wide up to 2½ feet deep.
   (Obtained by different length booms and boom control).
8. Self-Propelled — Drives on all four wheels while digging, rear wheels while in transport gear.
9. Hydraulically Controlled Digging Boom.

Manufactured by

BROWN MANUFACTURING CO., Inc.
WOODBINE, IOWA

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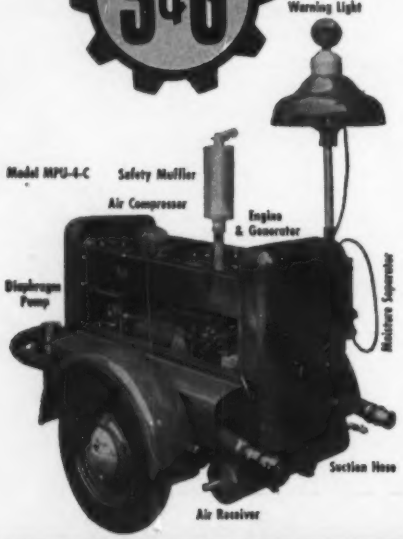
dependable . . . versatile . . .

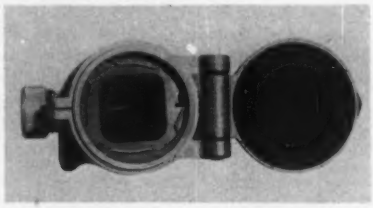
S&G Mobile Power Unit



- **Generator (slow speed for quietness) 2500 Watt, 110-Volt DC**
- **Pump—2800 GPH Diaphragm to remove seepage and drain back**
- **Air Compressor—to put cables under pressure for cut-overs or repairs**
  Furnished with or without pump and compressor
- 300-Watt floodlight illuminates working area
- operates soldering pot and iron, electric and air tools
- electric blower to ventilate manhole
- supplies dry air for cable cut-overs, flash testing, etc.
- diaphragm pump can be operated from manhole by push button control
- buzzer signal for summoning helper
- light, easy to handle

S & G MANUFACTURING CORPORATION
P. O. Box 1309 • New Orleans 10, La. • JAckson 5-3142

four-prong plug (in brown or ivory) is simply plugged into the jack when in use, Suttle points out.



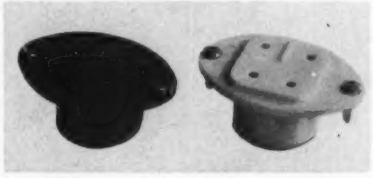
Ideal also for boat harbors, swimming pools, outdoor sports areas in season, etc., the jack is available at nominal cost and most tariffs include monthly rental charges for such a unit, the company also states.

Mounting eyes built into the aluminum body of the unit permit quick installation with wood screws on a house, garage, or other structure wall. Outside type wire is used. Request NP1182.

•

STANDARD JACK — Also available from Suttle is a standard S. E. 493A jack in brown or ivory high dielectric plastic, a Western Electric equivalent item.

The S. E. 493A, oval in shape, is used with the S. E. 19B plate (also in brown or ivory) for flush-mounted installation. All that is necessary for making the flush-mounted installation is the new oval S. E. 493A jack and the S. E. 19B plate, both of which are supplied with wood screws. The use of a conduit box may be eliminated.



The S. E. 404 jack, also containing four spring-tensioned jack holes, can be used for either flush or non-flush mounting needs, and the S. E. 493A is available for flush installation. Request NP1183.

•

TERMINAL BLOCK COVERS IN BLUE-BEIGE — Suttle also announces availability of S. E. 101A, S. E. 101C, and S. E. 101D plastic covers for S. E. 44A terminal blocks in blue-beige. They have heretofore only been available in brown or ivory plastic.

The blue-beige color, Suttle points out, tends to harmonize with almost any existing home or office color scheme and is virtually lavender colored in hue. Request NP1184.

•

TEST SET FOR VOICE CIRCUITS—

How can you save money on pole installation?

String your lines with USS Tiger Brand Amertel 195.

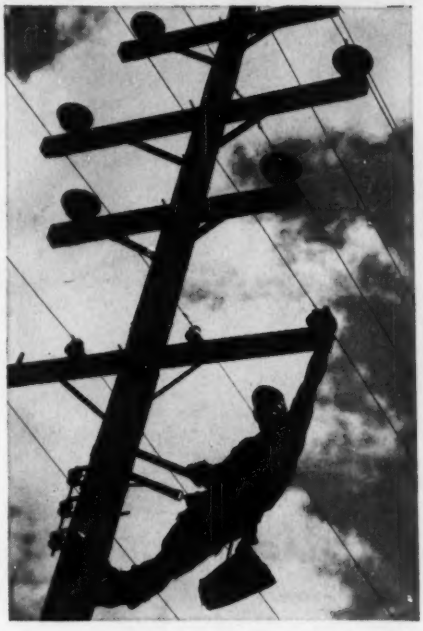
When you string your rural telephone lines with Tiger Brand Amertel 195—the bonus telephone wire that is engineered for spans up to 700 feet—you cut down on the number of poles needed. With fewer poles, your installation cost per mile of line will drop substantially.

There are other ways this superior quality telephone wire can improve your service, reduce your maintenance and installation costs:

- Amertel 195 stands up under severe weather conditions, reducing service interruptions to a minimum.
- Telephone lines can easily be strung over rivers, gullies or other areas requiring spans of unusual length.
- The low resistivity of this fine wire results in improved voice transmission even at relatively high frequencies.

For more information on Tiger Brand Amertel 195, send for our free booklet. Write to American Steel & Wire, Dept. 9184, Rockefeller Bldg., Cleveland 13, Ohio.

USS and Tiger Brand are registered trademarks



American Steel & Wire
Division of
United States Steel

USS

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, Distributors Abroad

PAGE WIRE

—now offers

ACCO *Aluminized* Telephone Wire and Strand

Here are two new examples of PAGE'S pioneering leadership—the same kind of leadership that earlier was responsible for the development of Stainless Steel Strand, and was instrumental in developing Stainless Steel Lashing Wire:

1 • Our new ACCO *ALUMINIZED* Telephone Wire, combining the strength of steel with the corrosion-resistance of a bonded coating of aluminum. Available in these grades: Best Best (BB); Grade 85; Grade 135; Grade 190 (Support Wire) and Steel Construction Wire.

2 • Our new ACCO *ALUMINIZED* Steel Strand, also with a bonded coating of corrosion-resisting aluminum. Made in 3-, 7- and 19-wire construction. Available in Common, Siemens-Martin, High Strength, Extra High Strength and Utility grades.

We consider the unique aluminized coating of these wires to be superior to Class C galvanizing—in longer service life under virtually all conditions. Yet, with all their advantages, you can buy them at *much lower prices!*

***For full details,** see your Telephone Supply Distributor —or write our Monessen, Pennsylvania, office.*

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

TRENCHES

2¾" to 8" wide • Depths to 6'
Self-Propelled•Hydraulic Drive
Low Cost • Pays for Itself!

The economic Arps Model M-A Trench-Devil will handle most of your trenching jobs faster, easier and at lowest cost per foot of trench. For the largest percentage of ditching work — foundations, water services, underground wiring, gas lines, sprinkler systems — this heavy duty, one-man outfit will outdig larger units costing many times its low price. Get more information *now* on this and other famous Arps Trenchers for larger and smaller jobs. The Arps Corporation, New Holstein, Wis. Dept. T.

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NEW HOLSTEIN, WIS.

TRENCHERS
HALF-TRACKS • BULLDOZERS
UTILITY BLADES

TYPE 86 KEY TELEPHONE

Saves time and steps around the office!

Key telephone service gives your subscriber access to all office lines—*at one desk!* No more racing around the office to answer phones. Instead, he lifts the handset of his key telephone, presses a button and the call is connected. He holds outside lines while using another line, too. Your subscriber saves time and steps—gets more work done!

The Type 86 Key Telephone gives your subscriber a complete communications package. It's used with the Automatic Electric 10-A1 Key System—or W.E. 1A and 1A1 Systems.

Type 86 Telephones accent any office decor. They're available in 10 attractive colors. Use Type 86 Telephones to boost your revenue. Write for full ordering information.

AUTOMATIC ELECTRIC GENERAL TELEPHONE SYSTEM

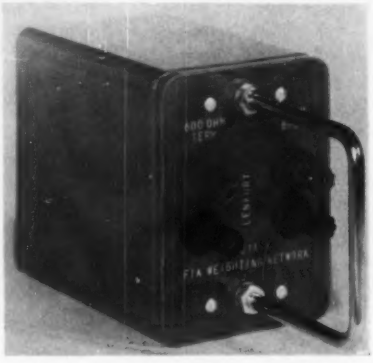
Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

Lenkurt Electric Co. announces a convenient and economical means of making F1A-curve weighted noise measurements of any telephone voice circuit is embodied in its latest piece of telephone maintenance equipment.

The Lenkurt Type 601A weighting network adapts any good-quality, high-impedance, vacuum-tube voltmeter to read F1A noise measurements, according to the company.

A 3-foot connecting cord equipped with shielded banana plugs is furnished to connect the Type 601A network to a VTVM. The meter reading is subtracted



from a calibration factor to obtain noise measurements in dba. The set provides an insertion gain of 10 db, and may be used to measure noise as low as 10 dba on a +7 dbm drop level voice circuit.

Lenkurt says the unit is compact, portable and able to withstand rough field usage. It measures 8 inches by 3¼ inches by 4¼ inches, and is cased in aluminum. The carrying handle protects the banana-type terminals. Shipping weight is about 4 pounds. Request NP1185.

•

MEASURING WHEEL FOR UNEVEN TERRAIN — Rolatape, Inc., announces it is now possible to obtain accurate and dependable measurements from a measuring wheel that can be rolled over even the most irregular and uneven terrain. The company's newest product is a precision-calibrated instrument, Rolatape Model 415, for all-round outdoor measuring jobs.

The new measuring wheel can be operated by one man, registering measurements to ½ inch on one side of the disc wheel and tenths of a foot on the other.

Rolatape says its new instrument is sturdily constructed and has a wide neoprene tire that provides positive traction under all conditions. Equipped with an automatic brake and a built-in stand, the 415 handle folds compactly

when not in use. A zippered carrying case is available.

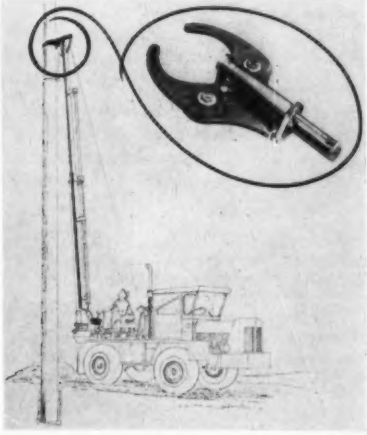
One man can roll it along to measure up to 100,000 feet (almost 19 miles). Curves and contours are measured just as easily as straight, flat surfaces the company states; also, it can be operated from a car window when driving at low speeds.

Rolatape Model 415 supplements a line of precision-calibrated measuring wheels including the Model 200 for indoor-outdoor use on smooth sur-

faces, Model 600 for heavier field work, Model 660 for agricultural use, the Model 100 measuring in the metric system, and Model 600-G which measures in yards. Request NP1186.

•

POLE ALIGNER—A new power-operated pole aligner, designed to handle any size pole, has been announced by the Calavar Corp.



The Hydra-Pike consists of two pincer-type arms mounted on a steel platform at the derrick head sheave. The

TYPE 88-T SPEAKERPHONE

World's most compact loud-speaking phone!

Automatic's new Type 88-T Speakerphone is the most compact loud-speaking phone you can buy. That's because it's transistorized! There is no control cabinet. It's the *same size and shape* as our famous Type 80—no extra bulk.

With the Type 88-T, no special power supply is required. You install it like a regular phone... without time-consuming delays.

Speakerphone gives your business subscribers *no hands* telephoning. It's ideal for conferences. Install it in the home, too. The lady of the house appreciates its convenience when she has her hands full.

You can get Speakerphone in a choice of 10 eye-catching colors. For the full story on the Speakerphone, write for Circular 1857-C.

AUTOMATIC ELECTRIC

GENERAL SYSTEM

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

Save Money in the Long Run

NATCO CLAY CONDUIT, economical to install and maintain, is the low cost way to give Underground Telephone Cables permanent protection. Available in a full line of shapes.

NATCO CORPORATION

327 Fifth Ave., Pittsburgh 22, Pa.

●Here's the reel jack that is strong and stable without hard-to-handle extra weight. An aluminum alloy housing reduces overall weight by 21 pounds, yet maintains full 10-ton capacity. "I" shaped laminated oak base gives solid, safe foundation. Single acting mechanism provides easier operation. Handles reels to 84" dia.; weighs 83 lbs. Furnished with 5' lever bar.

Write for full data on Reel Jack No. A-1029 and other Simplex Utility Jacks.

Pole Pulling and Straightening Jacks—Save time, cut work crews necessary to pull, straighten or move poles. No. A-1538 has aluminum housing, 15-tons capacity, weighs 63 lbs.

All-Purpose Jack — No. 310A lifts, pulls, pushes at any angle. Four lift points, 15-tons capacity.

WORLD'S LARGEST MFRS. OF INDUSTRIAL MECHANICAL AND HYDRAULIC JACKS

SIMPLEX JACKS

TEMPLETON, KENLY & COMPANY

2557 Gardner Road, Broadview, Illinois

arms or pincers are hydraulically operated. Hydraulic line retracting system is available for telescopic booms.

The complete system can be mounted on most derricks, cranes, booms, and diggers used throughout the utility industry, the Calavar company states. The finger-tip controls can be mounted anywhere.

Designed for one-man operation, the Hydra-Pike eliminates the need for pike poles to align utility poles, according to the company. This results in reducing construction and maintenance costs. Furthermore, it reduces the hazard of injuries to personnel. Request NP1187.

•

AIR LADDER — The "Air Ladder" which can be readily mounted on any truck, 1½ tons or larger, has been introduced by Root Spring Scraper Co. It is hydraulically controlled, the hydraulic pump being powered by a 6 or 12-volt motor operating off the truck battery. No power take-off unit is involved.

The platform working height is 22 feet. Safe load capacity is 500 pounds. Swing arc is 170°. An operator can control the ladder from the platform.

The company points out that the "Air Ladder" is a boon to telephone companies for regular aerial jobs such as maintenance of lines and tree trimming. Request NP1188.

•

PORTABLE ENGINE GENERATOR —"More power per pound and easily portable," is the way Mr. R. F. Weinig, vice president of Wincharger Corp. describes the new Winco Lite portable engine generator. This compact portable power plant is rated at 2500 watts but develops up to 3000 watts ac intermittent power, yet weighs only 123 pounds with carrying handle. The Briggs & Stratton four-cycle aluminum engine has service facilities nationwide, the Wincharger company states.

The company adds that the Winco Lite generator offers certain advantages in its exclusive Automatic Conserv-er Idling Control, and full power at either voltage from one outlet, 115 V or 230 V. The control box contains one 15-ampere duplex receptacle and one 20-ampere three-wire Twist-Lock receptacle, and one 20-ampere two-wire Twist-Lock receptacle.

Regularly equipped with Safe-T carrying handle as illustrated, the Winco Lite is also available with stationary base, a Speedy Shift two-wheel dolly, or carrying cradle.

Wincharger Corp., a subsidiary of Zenith Radio Corp., manufactures a line of engine generators and tractor generators from 300 to 10,000 watts capacity for portable and standby power. Request NP1189.

Mich. Bell Promotes Four, Creates Marketing Post

Four top-level personnel changes and the formation of a new general department within the Michigan Bell Telephone Co. were announced recently by William M. Day, president. The changes are as follows:

James M. Smith, general traffic manager since 1953, becomes vice president and general counsel.

J. L. Conroy, general commercial manager since 1954, has the new post of general marketing manager.

Charles K. Esler, general directory manager, is general traffic manager, succeeding Smith.

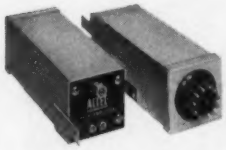
Kenneth J. Boekeloo, assistant general commercial manager, becomes general commercial manager, succeeding Conroy.

Mr. Day's announcement followed a special meeting of the executive com-

ALTEC TELEPHONE EQUIPMENT

Compact · Versatile · Easy to Service

The advanced design of ALTEC telephone equipment makes it ideal for modern telephone systems. In addition to its reliability and high standard of performance, ALTEC equipment requires a minimum amount of space. Inherent flexibility makes it useful in a wide range of applications. Easy maintenance is **designed in** to save time and money in servicing.



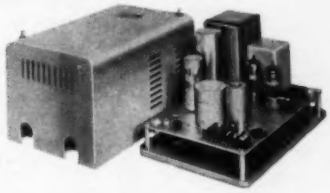
447A TRANSISTOR AMPLIFIER
Telephone Repeater Type

Directly interchangeable with vacuum tube repeaters; dimensions are identical. Requires only 24 - 48 volts. Eliminates need for 130v supply.

SPECIFICATIONS:
Type: Repeater Amplifier (transistorized) • Gain: 37 db from and into 600 ohm loads • Power Output: +18 dbm (at +10 dbm distortion is 1.5%, 300-3000 cps) • Frequency Response: −1 db at 200 and 5000 cps referred to 1000 cps • Input Impedance: 600 ohms • Output Impedance: 600 ohms • Output Noise Level: −70 dbm • Controls: Input volume control which varies gain from −2 db to maximum gain • Power Required: 17 - 24 v (50 ma @ 20 volts) • Transistors: 1—2N191, 1—2N188A • Dimensions: 1¾" x 1¾" x 6" • Color: Cadmium plate with dichromate finish • Weight: 14 oz. • Mounting: 11 pin Amphenol 86 CPN plug • Monitor Tap: Auxiliary output winding 11 db below 600 ohm winding available at test jacks on front panel and at connector pins at rear of unit • Accessories: Panel for rack mounting 10 repeaters; Rack mounting power supply capable of energizing 100 repeaters; Equalizer; Panel for mounting up to 10 equalizers; Assembly for mounting a 447A in 105B apparatus box.

444B AMPLIFIER
COMPRESSION TYPE

Compression, attack and recovery times are fixed quantities providing optimum performance for message use.



SPECIFICATIONS:
Type: Compressor Amplifier • Gain: 600 ohm input: 70 db • Bridging input: 57 db bridging 600 ohm line • Maximum Compression: 35 db change in input results in 15 db change in output • Power Output: 34 dbm at 30 db compression; 35 dbm with rectifier tube removed • Frequency Response: −2 db at 100 and 3000 cps relative to 1000 cps; More than 10 db down at 10,000 cps • Input Impedance: 600 ohms balanced and 12,000 ohms balanced for bridging • Source Impedance: 600 ohms • Load Impedance: 4 and 600 ohms • Noise Level: 80 db below rated output; −115 dbm equivalent input noise • Power Supply: 117 volts, 60 cps, 30 watts • Tubes: 1—6BC8, 1—6AL5, 2—12BY7A • Dimensions: 9" x 6" x 5" • Weight: 7½ lbs. • Attack Time: 50 milliseconds • Recovery Time: 1 second for 63% recovery • Harmonic Distortion: At 33 dbm output, less than 5%, 200 - 4000 cps; At 30 dbm output, less than 2%, 200 - 4000 cps.

S-17B PROGRAM
AMPLIFIER SYSTEM

Cabinet houses two program-quality 437B amplifiers capable of multiple tandem operation, two 17224 equalizers, and two jack fields to facilitate testing, equalizing, and monitoring. Each amplifier contains its own AC power supply and mounts in the cabinet independently on a plug-in basis for easy replacement and centralized maintenance.

SPECIFICATIONS:
Output Power: +24 dbm • Distortion: not over ½% THD (30 - 15,000 CPS at +24 dbm) • Gain: at least 44 db; adjustable to minimum of 8 db • Gain adjustment: 2 db steps and 1½ db vernier • Frequency response: ±1 db, 20 - 20,000 cps • Equiv. input noise: −115 dbm • Input impedance (internal): 150/600 ohms ±5% • Output impedance (internal): 150/600 ohms ±5% as measured at output of the bridge • Longitudinal balance of input circuit and output circuit with 600 ohm connection: 55 to 60 db at 40 and 15,000 cps; 70 db at 1000 cps • Tubes: 1—12AY7, 2—12BY7A • Electrolytic condensers: Sprague 17D or equivalent • Transformer insulation: 1500 volt insulation between primary and secondary windings • Impendance change simply accomplished by reversing the impedance plug. Occupies 9⅜" of 19" rack space.

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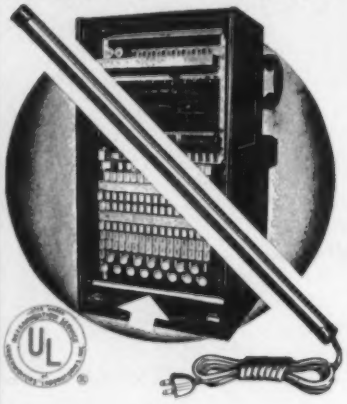

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mittee of Michigan Bell's board of directors.

In his newly-created position, Mr. Conroy's duties will include marketing studies, business sales, directory sales and compilation, and coin box collections.

Mr. Smith, a graduate of Detroit's Northwestern High School, obtained his A.B. and L.L.B. degrees from Cornell University. He joined the Michigan Bell legal staff in 1940 after serving with two Detroit law firms.

He was made Michigan Bell's general attorney in 1945 and became general counsel for the company in 1950. In February, 1953, he became assistant general manager and was appointed general traffic manager five months later.

Conroy, who was born at Tipton, Ind., joined Michigan Bell at Pontiac in 1929 after graduation from the University of Notre Dame. He became assistant general commercial manager in 1952 after serving in various commercial capacities in the Pontiac, Flint, Port Huron, and Detroit areas. In August, 1954, he was appointed assistant vice president and four months later was named general commercial manager.

Mr. Esler began his Bell System career with Western Electric Co. in 1936 at Detroit and left a year later to attend the University of Michigan. He joined Michigan Bell as a commercial student in 1941 after receiving an A.B. degree. He held a variety of administrative posts with the company in Detroit and Ann Arbor before he was named general directory manager in January, 1957.

Mr. Boekeloo joined Michigan Bell as a plant student at Kalamazoo in 1947 after his graduation from Kalamazoo College. From 1952 to 1955, he was on special assignment in New York with the American Telephone & Telegraph Co. After his return, he served as district plant superintendent at Wyandotte and as Woodward division plant superintendent before being named assistant general commercial manager in September 1958.

Buckeye Names Pawlak Eastern Representative

The appointment of Raymond E. Pawlak as eastern sales representative for the Buckeye Telephone & Supply Co. on Aug. 26 has been announced by R. L. Hepner, general sales manager of the Columbus, O. company.

Upon graduation from Farrell, Pa. high school, Mr. Pawlak entered the United States Navy, served in Cuba, Panama, and at the South Pole, and was awarded the Victory Medal.

R. E. PAWLAK

Upon completion of his naval service, he entered Allegheny College, from which he graduated in 1952.

He became associated with the Pennsylvania Bell Telephone Co. at Pittsburgh, and participated in that company's student engineering course, served in the engineering department and also served as instructor in the plant training center school.

At the time of his leaving the Penn-

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sylvania company, Mr. Pawlak was responsible for installation and maintenance of Bell communication services in a large section of downtown Pittsburgh.

Mr. Pawlak will travel the entire state of Pennsylvania for Buckeye, as well as certain portions of northern Maryland, New Jersey and the southern section of New York.

Robert Rozman, whom Mr. Pawlak succeeds, has left the telephone industry to become associated with his father-in-law in the mill and mine supply industry.

Walker Manager Raytheon Communication Systems

Leonard G. Walker has joined Raytheon Co.'s equipment and systems division as manager of the communication and control systems department, a newly created post.

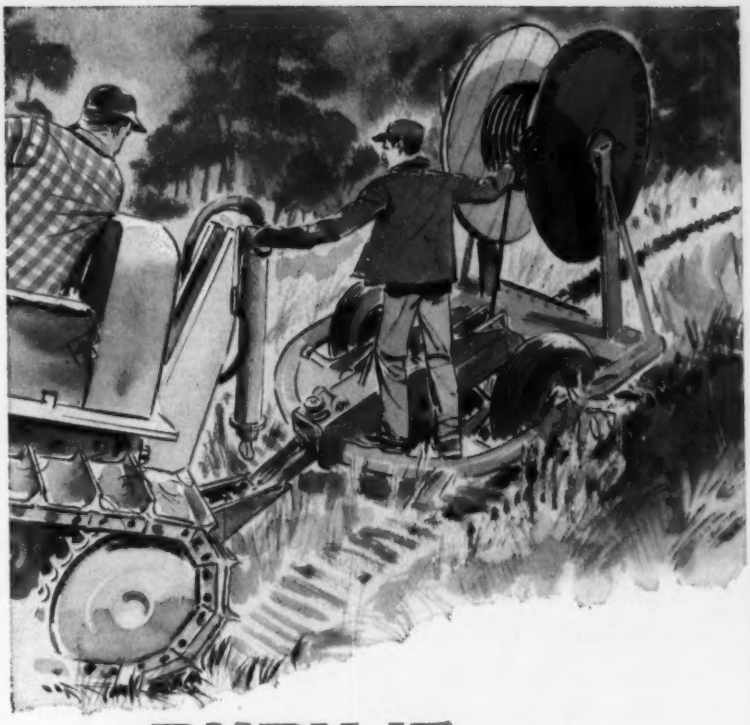
Mr. Walker was formerly with Motorola where he served successively as chief engineer of carrier and control, manager of power utility products, and for the last four years as marketing manager for microwave and industrial controls.

L. G. WALKER

Prior to joining Motorola in 1951, he was an electrical engineer with the Idaho Power Co.

Mr. Walker, who received his electrical engineering degree from the University of Utah, is a member of the Institute of Radio Engineers, the Instrument Society of America, and the American Institute of Electrical Engineers. He is also a registered professional engineer.

A patent holder and author of numerous technical articles, he is chairman of the microwave section of the industrial electronics division of the Electronic Industries Association.



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Lund Named Warren Sales Engineer in Chicago Area

Richard Lund has been appointed Warren Mfg. Co. sales engineer in charge of telephone power equipment in the Chicago area.

After spending a month at the Littleton, Mass. plant, he will open his Chicago office at 3802 Stanley Ave., Riverside, Ill.

Mr. Lund is well known in the Chicago region having formerly been employed at Kellogg Switchboard & Supply Co. systems engineering division as a supervisor of facilities and outside plant engineering.

His new duties with Warren will be to coordinate sales and direct public relations in the Middle West and Western states.

Enlightening the Mass

"Here is a fact so dimly appreciated it can be classified as secret: Further enlightenment of the man reflected in one's own mirror is the sole means he has of bringing more light to others." —LEONARD M. READ, on "The Mass Man."

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F-16, 5½ ft. stub 10
12 ft. stub 12
F-26, 5½ ft. stub (4 for $50) ea. 15
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